New taxa, combinations and typifications in *Verticordia* (Myrtaceae: Chamelaucieae)

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Abstract

George, A.S. New taxa, combinations and typifications in *Verticordia* (Myrtaceae: Chamelaucieae). Nuytsia 7(3): 231-394 (1991). The history of *Verticordia* DC. is summarised. The morphology is reviewed, in particular the anthers, many of which are illustrated by scanning electron micrographs. The cytological findings of Rye (1979) are reviewed. The generic status is assessed and maintained in its broad sense. A new infrageneric classification of the genus *Verticordia* is provided, including 1 new subgenus and 18 new sections, while 3 names are given new status at sectional level. 41 new species, 12 new subspecies and 22 new varieties are described; 3 previously published names are reinstated as accepted species. 7 names previously published at specific rank are reduced to varieties and 1 to subspecies. *Darwinia verticordina* F. Muell. is transferred to *Verticordia*. The genus now contains 3 subgenera, 24 sections, 97 species and 42 infraspecific taxa. Keys to all taxa are provided. Lectotypes and neotypes are chosen for a number of earlier names. Distribution maps are provided for all new species and infraspecific taxa.

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Introduction

The purpose of this paper is the concise presentation of a review of the genus *Verticordia* DC. (Myrtaceae: Chamelaucieae). It covers new taxa and combinations, lectotypifications and neotypifications and presents an infrageneric classification. Keys to all infrageneric taxa and species are provided; infraspecific taxa are keyed out under the relevant species.

The paper will be followed by a book on the genus by Elizabeth A. George (formerly E.A. Berndt), in which all taxa will be illustrated in colour, and later a treatment by the author in the "Flora of Australia". Both these publications will contain descriptions of all taxa. A Verticordia Reference Collection has also been compiled by Elizabeth George, with the assistance of many collectors and observers. This contains representative specimens of almost all species and infraspecific taxa, and is available for consultation in the Reference Collection of the Western Australian Herbarium.

As is the case with many genera in the Australian flora, *Verticordia* has not been revised since the treatment by George Bentham (1867). Several taxa have been described since then, but it has been obvious to workers in Western Australia that some names have been wrongly applied and that many new taxa awaited description. Compilation of the Verticordia Reference Collection has accentuated the need both for a review and its early publication. Research on the cultivation of these colourful plants is also increasing rapidly.

History

The first specimens of plants later to be named *Verticordia* were collected at King George Sound in October 1791 by Archibald Menzies, on the Vancouver expedition. These specimens, of *V. plumosa*, are now at the Natural History Museum, London. Most subsequent collectors gathered specimens of *Verticordia*, but it was not until 1826 that the first two species were named by René Louiche Desfontaines, and then in the genus *Chamelaucium* which he had described in 1819. Two years later, Augustin Pyramus de Candolle recognised these as a distinct genus to which he gave the name *Verticordia*. Although he did not explain the etymology, it has generally been taken as a reference to the ancient goddess Venus as the 'turner of hearts' (e.g. Schauer 1840).

Discovery of new species became rapid after the Swan River colony was founded in 1829. Many species were described by European botanists (especially John Lindley, Stephan Endlicher, Johann Schauer, Nicolas Turczaninow and Carl Meissner) from collections sent from the colony. Lindley published a new generic name, *Chrysorhoe*, for one species but it was not maintained by other workers. One species described during this period, *V. carinata* Turcz., was known only from the type (Figure 15) until its rediscovery in March 1990.

In 1859 the first species to be described in Australia were published by Ferdinand Mueller (*V. wilhelmi* F. Muell., published in 1855, is now placed in *Homoranthus*). By the time Bentham (1867) treated the genus in "Flora Australiensis", 37 species were known. Four new species were described in that work, one of which, *V. harveyi* (Figure 23), has only recently been rediscovered. Between then and the present paper, however, research has been piecemeal. Later in the 19th Century, Mueller described four more species. Spencer Moore described one in 1898, and Ludwig

Diels and Ernst Pritzel several in 1904. Subsequently, only six further species have been described, two by Charles Gardner in 1934 and 1943, one by Gardner and Alex George in 1963, one by George in 1966, and two tropical species by Norman Byrnes in 1977.

Green (1985) listed 53 species for Western Australia, all except two of which are here maintained at that rank. To these may be added *V. decussata* Byrnes from the Northern Territory. In the present paper, 97 species are recognised, together with 42 infraspecific taxa. The large increase reflects factors common to a number of Western Australian genera: superficial resemblance of many species; the existence of localised taxa, many discovered within the past 30 years as accessibility improved; and lack of resources to review the genus earlier.

Methods

This review is based on a study of the gross morphology of herbarium and, in many taxa, fresh material, as well as specimens preserved in formalin-acetic-alcohol. Measurements were taken where possible from fresh, preserved or detergent-softened specimens. Most taxa have been studied in the field to record habit and habitat data, as well as flower colour and perfume. The last was a subjective assessment made at the time of collection - no nocturnal checks were made.

Because androecial characters are useful in distinguishing many taxa but the anthers are of small size, many were examined and photographed by means of a scanning electron microscope.

Material housed at 20 herbaria was examined. Types of all except two previously named taxa were located; for those two the types are assumed lost and neotypes are nominated below. Photographs were taken of most type sheets and will be lodged in the Western Australian Herbarium (PERTH).

Diagnoses are provided for all infrageneric taxa together with a list of included species. In the treatment of species, only new taxa, new combinations and taxa needing lectotypification are covered. For economy, no treatment is given of other previously published taxa. The key to species, however, includes all species, while infraspecific taxa are keyed out under the species.

For ease of reference species are treated alphabetically. The synopsis of infrageneric classification (pp 282-283) provides a systematic sequence.

Maps are provided showing the distribution of all new taxa. Localities were plotted by latitude and longitude. These are taken from all herbarium collections seen, including those in the Verticordia Reference Collection at PERTH. Vague and general localities (e.g. Swan River colony) have not been mapped. Specific details of localities of type collections and rare taxa have been omitted, in order to afford these populations some protection.

The conservation status of all species and infraspecific taxa has been assessed and, where appropriate, coded according to the criteria of Leigh et al. (1981). The assessment is based on the number of collections, localities and to a less extent estimates of population size. The last factor is approximate, no accurate counts having been made. Full surveys will be carried out by the Western Australian Department of Conservation and Land Management.

Two infraspecific ranks are recognised here. Subspecies is used for those taxa that are - 1) morphologically distinct but not sufficiently so to be given specific rank, and - 2) geographically disjunct from the other subspecies. Variety is used where the morphological distinction is less clear-cut (there are often intermediates) and the distributions overlap.

Latin diagnoses and descriptions were prepared using Stearn (1966) as the principal reference.

Morphology

Habit. Most species are shrubs less than 2 m tall. The tropical species *V. cunninghamii* and *V. verticillata* may grow to small trees up to 7 m tall. A few south-western species sometimes exceed 2 m, namely *V. cooloomia, V. grandis* and *V. lepidophylla.* The shrubby species have a wide range of form. The most common is a bushy shrub, openly to densely branched, sometimes rounded, sometimes corymb-like, sometimes irregular. The corymb-like habit may be slender, e.g. *V. nitens, V. cooloomia*, or broad and robust, e.g. *V. eriocephala.* Several irregular forms have crowded foliage, resulting in an arm-like growth, e.g. *V. crebra, V. longistylis.* Some species are widely spreading rather than erect, e.g. *V. huegelii, V. pulchella, V. penicillaris, V. oculata*; the extreme is *V. oxylepis* which has a main stem usually less than 5 cm tall and a single layer of horizontal branches.

Most species have a single basal stem and are fire-sensitive, being killed by fire. Regeneration is from seed. Six species consistently develop a small lignotuber which sprouts after fire; these are *V. brevifolia, V. coronata, V. grandis, V. oculata, V. ovalifolia* and *V. pennigera.* In a further seven species a small lignotuber occurs in some variants; these are *V. chrysanthella, V. insignis, V. densiflora, V. habrantha, V. huegelii, V. oxylepis* and *V. plumosa.* The three tropical species *V. cunninghamii, V. decussata, V. verticillata* - sprout from both the larger stems and the base after fire. The lignotuber has evolved in relatively few taxa of *Verticordia* compared with some other woody genera in the Australian flora, e.g. *Banksia, Melaleuca.* It is therefore of minor taxonomic significance in the genus.

Fire-sensitive forms usually grow rapidly from seed and are often at their most floriferous stage within five years.

Indumentum. In most species the vegetative parts are glabrous. A few have hispid stems, e.g. *V. staminosa* and *V. endlicheriana,* while several species of sect. *Sigalantha,* sect. *Penicillaris* and sect. *Verticordella* have ciliate or erose leaf margins.

Many species have a pubescent, villous or silky hypanthium, and in some the petals, sepals, androecium and style may be variously hairy. The hairs are always simple except those of the style, which may be branched. The style hairs are usually arranged in a beard on which the pollen is deposited and presented at anthesis. Indumentum terminology follows that of Hewson (1988).

Leaves. The leaves are simple and small, usually less than 2 cm long, and sessile or shortly petiolate. In some taxa there is a small pulvinus at the base which may persist on the branchlet after leaf fall. The lamina ranges from orbicular to narrowly linear and terete. The arrangement is decussate except in *V. verticillata* (in whorls of 3 or 4) and a few species in which they are scattered.

Most species of subg. *Chrysoma* have two leaf forms. Those of the seedlings and the lower, non-flowering branches are linear and terete to semiterete or triquetrous, and those of the flowering branches are broader and concave, e.g. *V. subulata,* or shorter and thicker, e.g. *V. grandiflora. V. cooloomia* has three forms, those of the main stem being intermediate between the basal and the floral leaves (Figure 17).

In species of sect. *Chrysorhoe*, subg. *Verticordia* and subg. *Eperephes* there is little difference (except sometimes in size) between the lower vegetative and upper floral leaves (e.g. Figures 21, 23, 25).

A few species can be recognised from the gross leaf form and arrangement, e.g. *V. serrata*, *V. crebra*, *V. oculata*, but usually floral characters are needed for determination.

Inflorescence. Despite the impression of corymbs, racemes and spikes, all species of *Verticordia* have solitary, pedunculate axillary flowers. In the terminology of Briggs & Johnson (1979), *Verticordia* has a uniflorescence consisting of a pedunculate monad with 2 prophylls but lacking an anthopodium. Great variation in the length of the peduncle and in the length of the flower-bearing part of the branchlet gives rise to the appearance of large inflorescences.

In those species that are corymb-like, the floral internodes are short, the lowest flowers have long peduncles and those above are progressively shorter (Figure 17). The branchlets may also be similarly arranged, giving the whole plant a corymb-like appearance with all flowers of each season at the same level, e.g. *V. nitens*, *V. eriocephala*, *V. roei* and *V. endlicheriana* (especially var. *compacta*). In others the branching may be less regular, giving rise to scattered corymb-like groups, e.g. *V. plumosa, V. vicinella.*

The peduncles may also be of more even length and the internodes short, in which case the flower groups are rounded, e.g. *V. brachypoda.*

Where the flowers have peduncles of even length the groups are raceme-like or spike-like depending on peduncle length (e.g. Figure 25). This is the case in much of subg. *Eperephes* and in *V. mitchelliana, V. humilis* and *V. staminosa.*

The flowers may be erect, as in most corymb-like forms, turned sideways, as in most raceme- and spike-like forms, and sometimes spreading (*V. staminosa*) or pendulous (*V. mitchelliana, V. humilis*).

In all species the prophylls are opposite and sessile, immediately below the hypanthium. They may be deciduous before or at anthesis or persistent. In several species they are united, e.g. *V. grandiflora, V. nobilis, V. rutilastra, V. chrysantha.* They are similar to the cheiridium as defined in *Calytrix* by Craven (1987) but for convenience are termed bracteoles in the treatment below.

Flowers. The *Verticordia* flower appears intricate, but much of the intricacy derives from having the sepals deeply divided in various ways. The petals are usually lobed, fimbriate or dentate, there are ten fertile stamens (five in *V. picta* and *V. rennieana*) alternating with ten staminodes, a simple but often hairy style, and the hypanthium is often hairy and/or sculptured and, in subg. *Eperephes*, bearing appendages. In all parts there is a large number of characters and states useful for distinguishing taxa.

Hypanthium. Following Johnson & Briggs (1984), this term is used in preference to perigynium and the less precise floral tube. The hypanthium is variously turbinate or hemispherical and is often 5- or 10-ribbed or -angled. It is sometimes constricted at the apex (e.g. *V. grandiflora*) or below (*V. eriocephala*, *V. brownii*). The surface may be smooth, rugose or honeycombed.

In subg. *Eperephes* the hypanthium bears five reflexed appendages around its upper margin, alternate with the sepals (Figures 9G & D, 10C). They are green and usually are closely appressed to the hypanthium. Although termed herbaceous appendages by Bentham and later workers, they are succulent or firm in texture and are here referred to simply as reflexed appendages. The function of these appendages is unknown. Their size and form are useful in assisting to distinguish some taxa, especially in sect. *Verticordella*.

Sepals. The sepals (in all except one species, *V. verticordina*) are divided into a number of lobes that are themselves plumose, fimbriate, erose or divaricately divided. In many species they also have recurved or reflexed basal auricles or cilia (Figures 9G, 10E), and in most of sect. *Pennuligera* there are reflexed basal lobes. There are five of these reflexed lobes, but one sepal has two, three each have one, and the fifth has none. These lobes are usually clawed and have a lamina that is peltate, scale-like and ciliate in some species, deeply fimbriate in others (and the divisions may be upturned at the base of the hypanthium).

Verticordia verticordina, previously placed in the genus *Darwinia*, has undivided erose to shortly lacerate sepals but in most morphological features is similar to the species of sect. *Infuscata*.

In the species treatments, the length of the sepal is measured from the base of the lamina to the apex of the longest fringe or lobe segment. In counting lobes only the well-defined segments are taken into account, not the small lateral cilia present in many species.

Petals. These may be free or variously united with the androecium. The lamina may be digitately divided, fimbriate, dentate or erose, or rarely entire (*V. picta*, *V. interioris*, *V. habrantha*, *V. integra*). In sect. *Pennuligera* and in *V. rennieana* each petal has two basal auricles.

The orientation of the petals varies between species. They may be spread horizontally or erect, and in many species they spread widely at anthesis but later close over the centre of the flower. This opening and closing occurs overnight in some species, e.g. *V. mitchelliana* and *V. capillaris*, but in others occurs over several days, e.g. *V. endlicheriana*.

The petals are measured from the base to the apex of the longest teeth, lobes or segments.

Androecium. All species have 10 stamens and 10 staminodes, except *V. picta* and *V. rennieana* which have 5 fertile stamens and 15 staminodes. As in the other floral parts there are many characters here useful for distinguishing taxa - form, size, orientation of filaments, anthers and staminodes. The stamens and staminodes may be free or variously united (into prominently tubular form in *V. staminosa* and *V. monadelpha*).

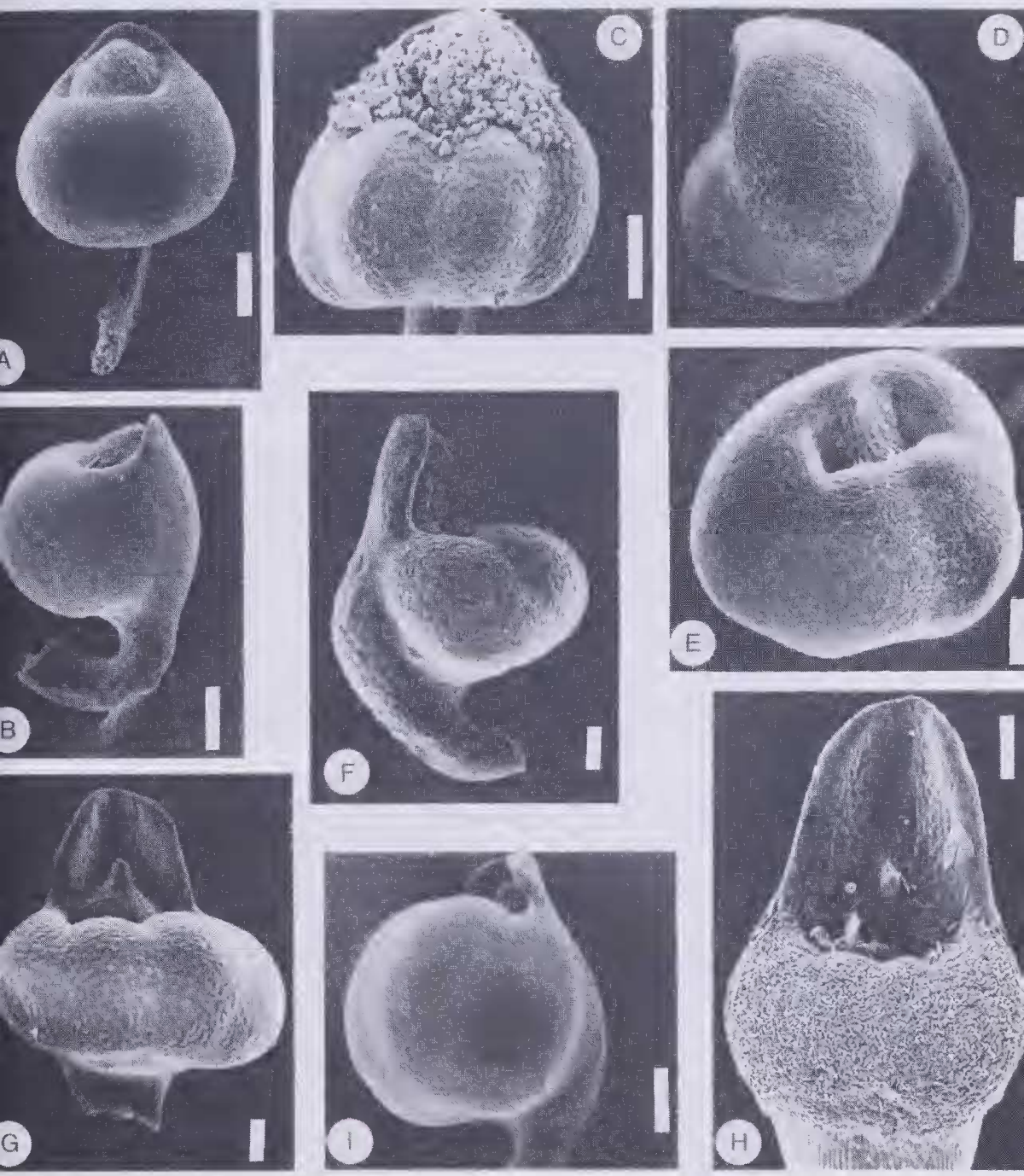

Figure 1. Scanning electron micrographs of *Verticordia* anthers. A, B. - *V. citrella* (*A.S. George* 16830). C - *V. endlicheriana* var. *endlicheriana*, with extruded pollen piled in front of appendage (*A.S. George* 16883). D, E - *V. subulata* (*A.S. George* 16506). F-H. - *V. brevifolia* subsp. *stirlingensis*, H after extruding pollen (*A.S. George* 16519). I - *V. amphigia* (*A.S. George* 16318). Scale bar = 100 µ (0.1 mm).

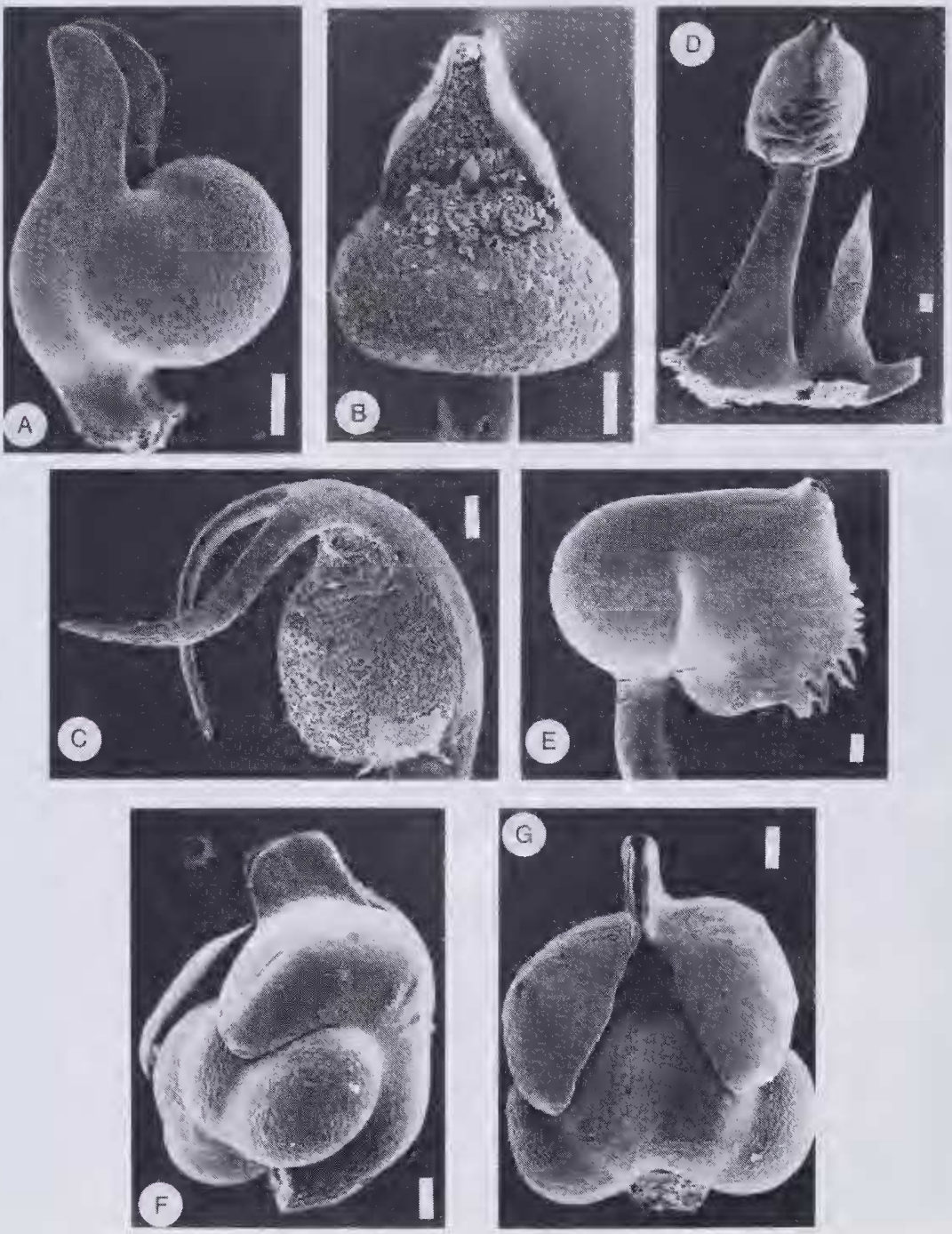

Figure 2. Scanning electron micrographs of Verticordia anthers. A - *V. integra* (*A.S. George* 16468). B - *V. serrata* var. *serrata* after extruding pollen (*A.S. George* 16461). C - *V. rutilastra* after extruding pollen (*A.S. George* 16315). D, E - *V. cooloomia*, C stamen and staminode (*A.S. George* 16843). F, G - *V. aurea* (*A.S. George* 16359). Scale bar = 100 µ (0.1 mm).

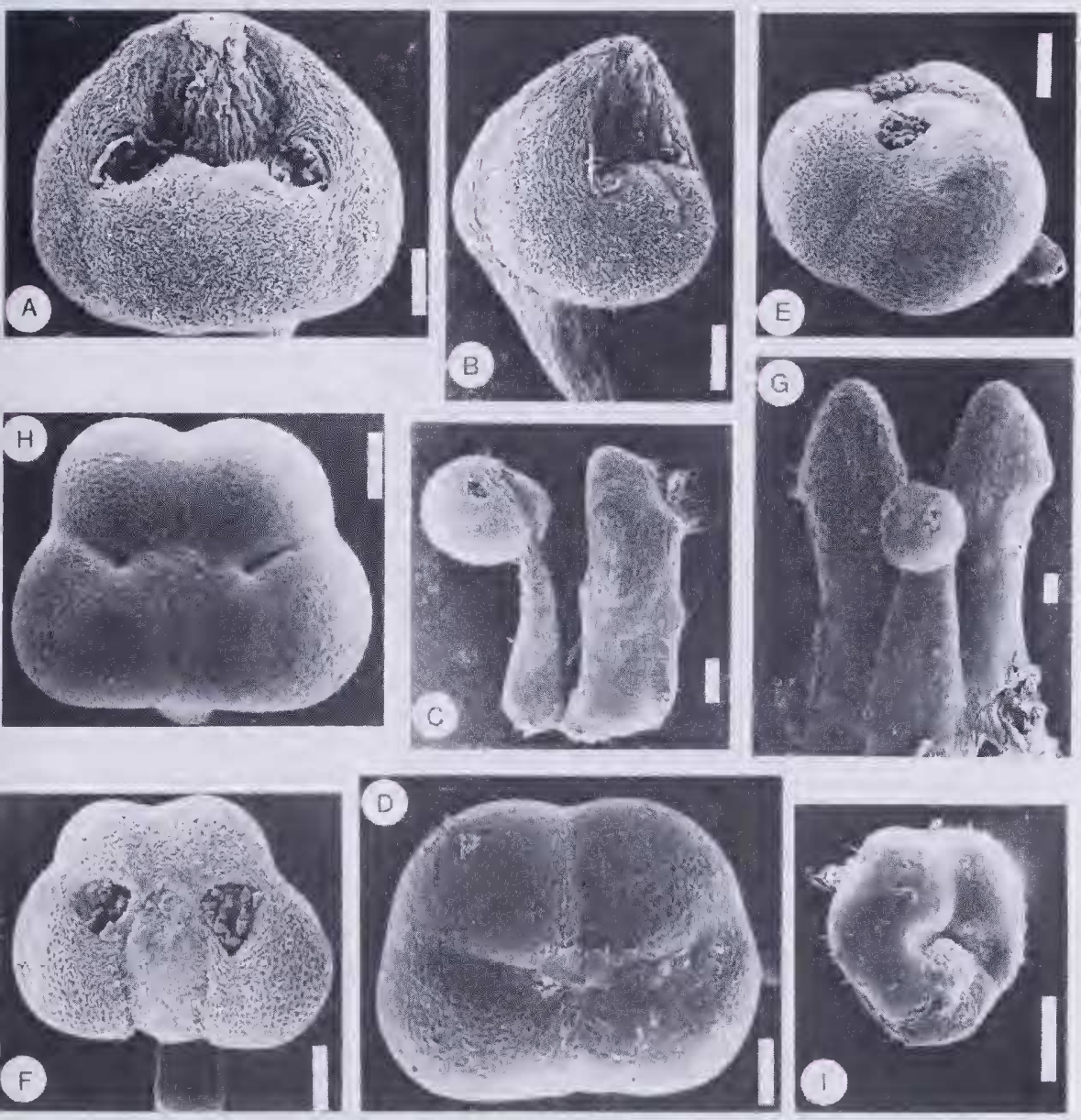

Figure 3. Scanning electron micrographs of *Verticordia* anthers and staminodes. A, B - *V. staminosa* var. *cylindracea* after extruding pollen (*A.S. George* 16465). C, D - *V. plumosa* var. *plumosa*, C stamen and staminode (*A.S. George* 16576). E, F - *V. plumosa* var. *grandiflora* after extruding pollen (*A.S. George* 16498). G, H - *V. stenopetala*, G stamen and staminodes (*A.S. George* 16437). I - *V. vicinella* (cultivated CBG, 31 March 1985, *A.S. George*). Scale bar = 100 µ (0.1 mm).

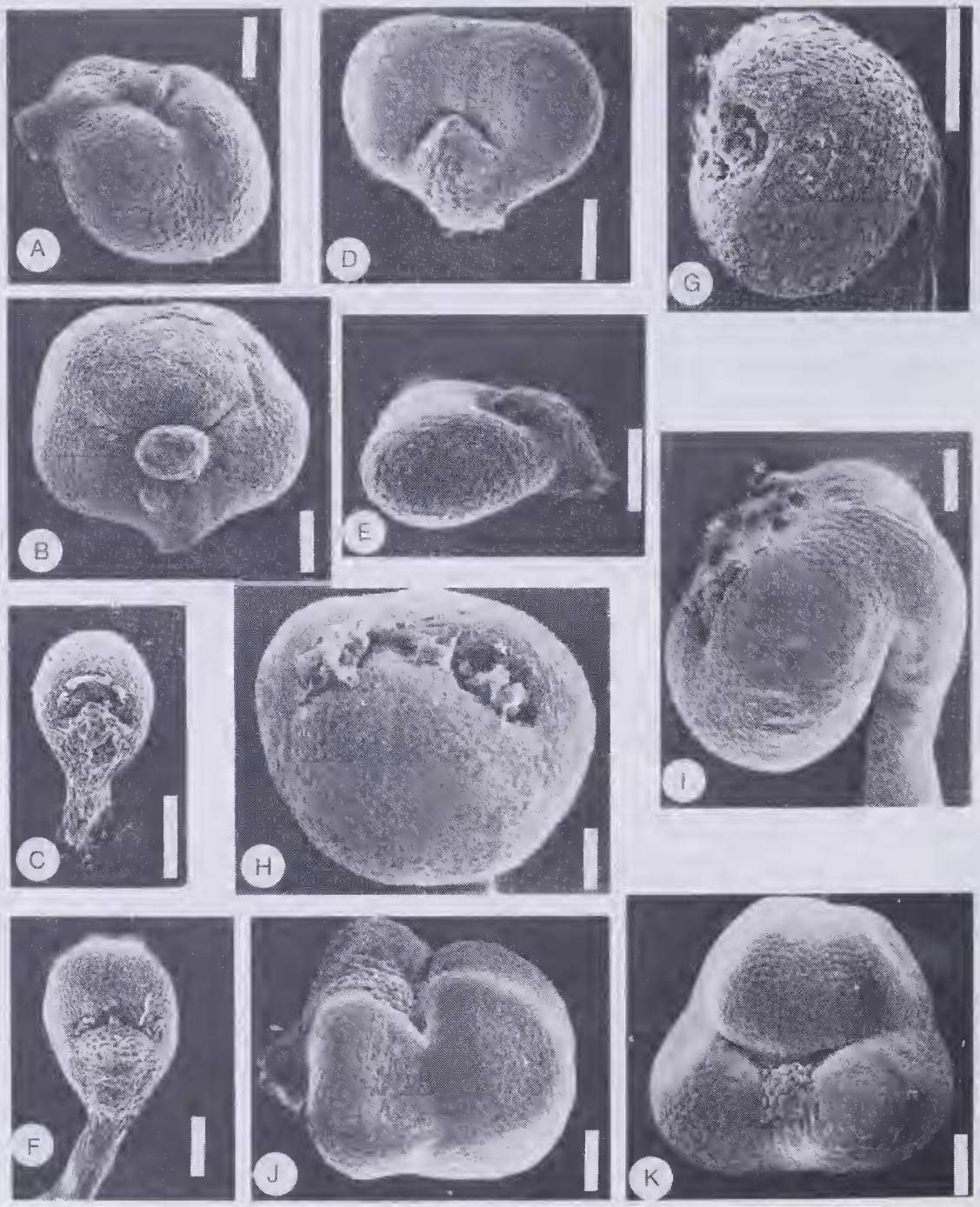

Figure 4. Scanning electron micrographs of *Verticordia* anthers. A-C - *V. densiflora* var. *roseostella*, C after extruding pollen (*A.S. George* 16835). D-F - *V. eriocephala*, F after extruding pollen (*A.S. George* 16562). G - *V. fastigiata* (Monjebup Rd, near Boxwood Hill, *D. Hutchinson*, 7 April 1985). H, I - *V. dasystylis* subsp. *kalbarriensis* extruding pollen (type, *D. & B. Bellairs*, 18 October 1987). J, K - *V. oxylepis* (*A.S. George* 16484). Scale bar = 100 µ (0.1 mm).

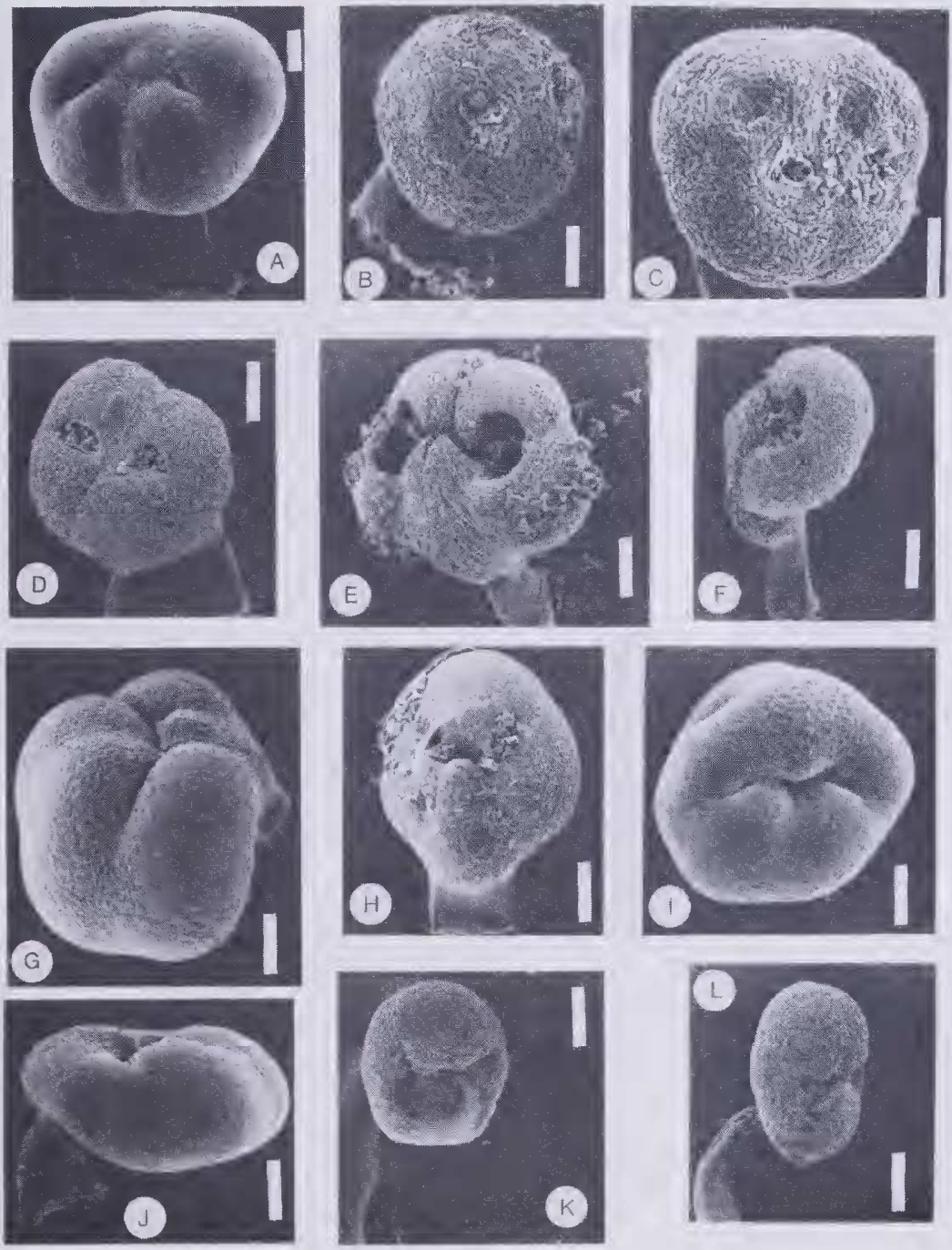

Figure 5. Scanning electron micrographs of *Verticordia* anthers. A, B - *V. multiflora* subsp. *solox*, B after extruding pollen (*A.S. George* 16447). C - *V. inclusa* after extruding pollen (*A.S. George* 16490). D - *V. habrantha* after extruding pollen (*A.S. George* 16481). E, F - *V. lehmannii* after extruding pollen - note grains (*A.S. George* 11778). G, H - *V. pritzelii*, A after extruding pollen (39 km E of Merredin, 22 October 1984 *A.S. George* s.n.). I, J - *V. gracilis* (*M. Smith* 130). K, L - *V. humilis* after extruding pollen (near Newdegate, *R. Cugley*, 23 October 1984). Scale bar = 100 µ (0.1 mm).

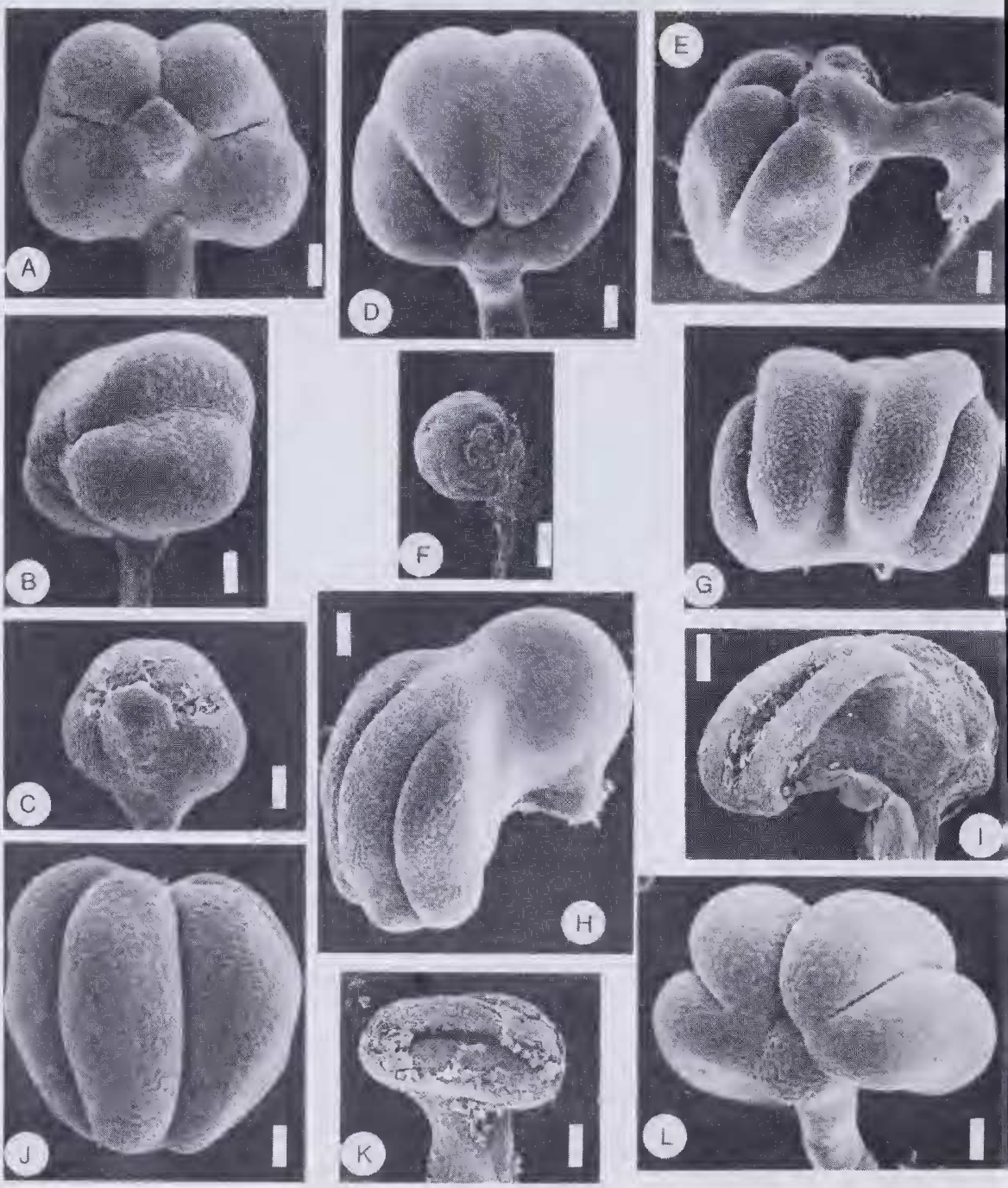

Figure 6. Scanning electron micrographs of *Verticordia* anthers. A, B - *V. monadelpha* var. *monadelpha* (*A.S. George* 16410). C - *V. monadelpha* var. *callitricha* (*A.S. George* 16556). D-F - *V. pulchella*, F after extruding pollen (*A.S. George* 16453). G-I - *V. rennieana*, I after extruding pollen (*A.S. George* 16411). J-L - *V. cunninghamii*, L after extruding pollen (*A.S. George* 12229). Scale bar = 100 µ (0.1 mm).

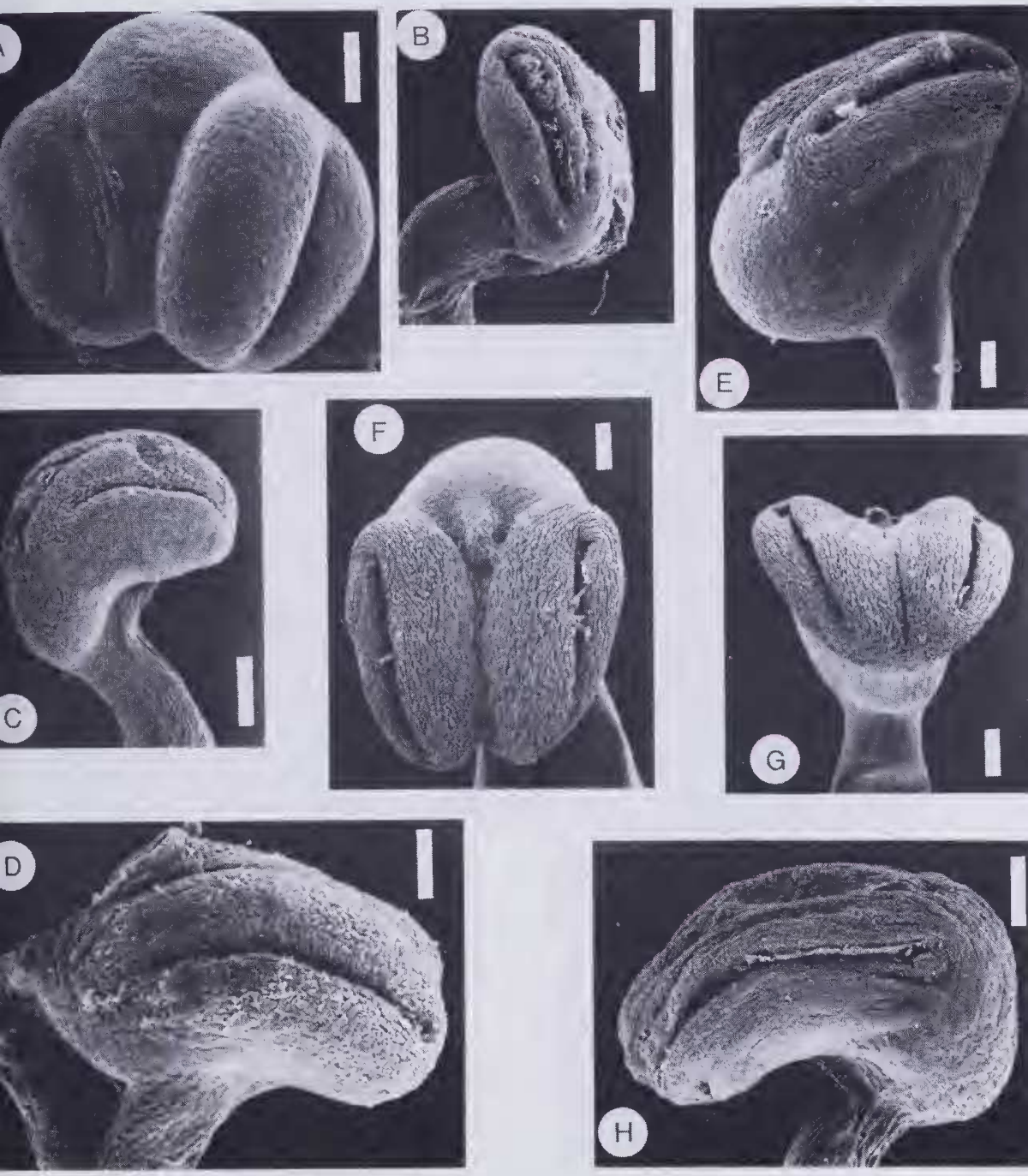

Figure 7. Scanning electron micrographs of *Verticordia* anthers. A, B - *V. centipeda*, B after extruding pollen (*A.S. George* 16566). C - *V. lepidophylla* var. *lepidophylla* after extruding pollen (*A.S. George* 16394). D - *V. serotina* after extruding pollen (*A.S. George* 10285). E-G - *V. etheliana* var. *formosa*, all after extruding pollen (*A.S. George* 16403). H -*V. fragrans* after extruding pollen (*A.S. George* 16361). Scale bar = 100 µ (0.1 mm).

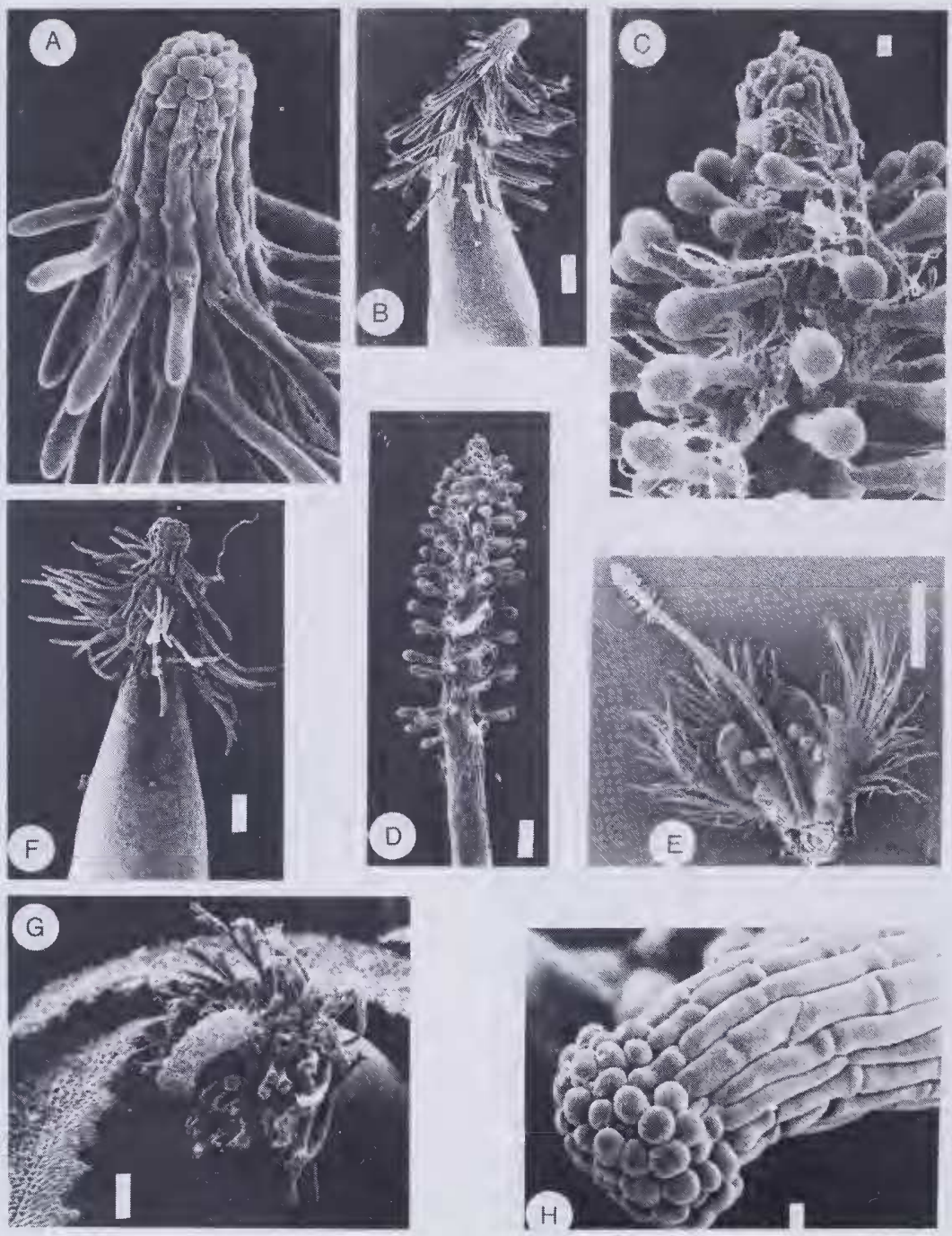

Figure 8. Scanning electron micrographs of *Verticordia* styles and stigmas. A, B - *V. densiflora* var. *roseostella* (*A.S. George* 16835). C-E - *V. vicinella* (cult. CBG, 13 March 1985, *A.S. George*). F - *V. oxylepis* (*A.S. George* 16484). G,H - *V. gracilis*, G also showing petal apices (*M. Smith* 130). Scale bar = 100 µ (0.1 mm) for A, C, H; 10 µ (0.01 mm) for B, D, F, G; 1000 µ (1 mm) for E.

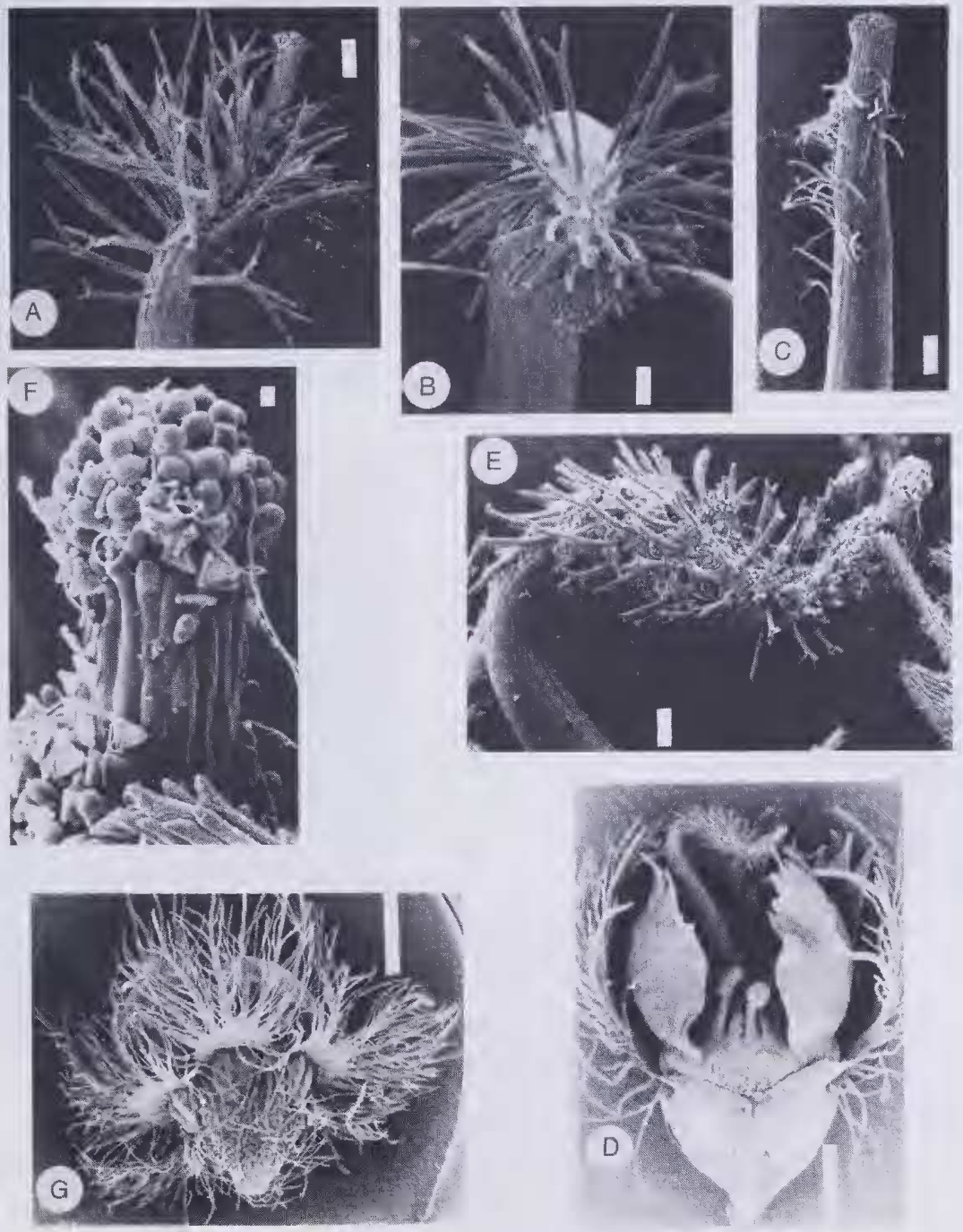

Figure 9. Scanning electron micrographs of *Verticordia* styles and flowers in part. A, G - *V. pholidophylla* (*A.S. George* 16384). B - *V. lepidophylla* var. *quantula* (*A.S. George* 16844). C - *V. pulchella* (*A.S. George* 16454). D-F - *V. lindleyi* subsp. *purpurea*, D with two sepals and one petal removed (*J. Seabrook* 24). Scale bar = 100 µ (0.1 mm) for A, B, C, E; 10 µ (0.01 mm) for F; 1000 µ (1 mm) for D, G.

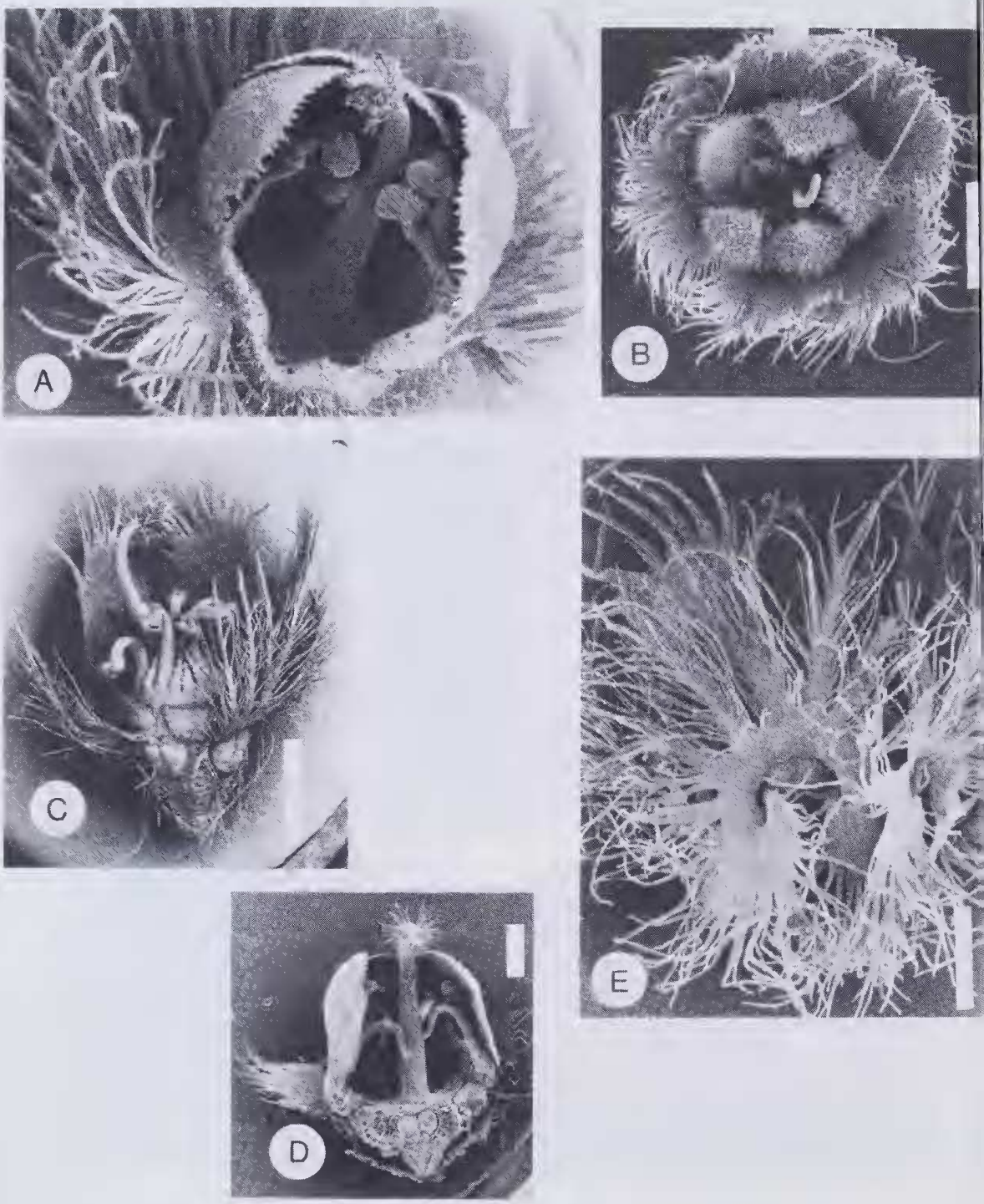

Figure 10. Scanning electron micrographs of *Verticordia* flowers in part. A - *V. gracilis*, with some sepals, petals and stamens removed (*M. Smith* 130). B - *V. capillaris* (*A.S. George* 16385). C - *V. pholidophylla* with one sepal and two petals removed; reflexed appendages of hypanthium visible (*A.S. George* 16384). D - *V. lepidophylla* var. *quantula* with part flower removed; ovules visible (*A.S. George* 16844). E - *V. auriculata*, from below to one side, showing basal auricles of sepals (*A.S. George* 16413). Scale bar = 1000 µ (1 mm).

The stamens are of equal length or alternately short and long. The filaments range from terete to somewhat flattened. They are usually glabrous, rarely hairy. Usually the staminodes are shorter. They are terete, compressed or flat, occasionally somewhat channelled, and glabrous, ciliate or glandular-warty.

In *Verticordia* the anthers extrude the pollen at anthesis. This is effected by a contraction of the locules, squeezing the pollen through the pores or slits. A slightly gummy substance (pollenkitt, Knoll 1930; Knox 1984) is also produced, holding the pollen grains together in a loose mass. According to species (and usually the absence or presence of a style beard) the pollen then either remains on the anther or is collected by the style, but in each case is presented to the pollinator. The pollenkitt of *Verticordia* is not highly coloured. It may be involved in one or more functions, e.g. adhesion to the pollinator or stigma, or incompatibility of pollen and stigma (Echlin 1971). A detailed study should be made of anther dehiscence, the formation of pollenkitt and pollen presentation.

There are no recorded pollinators for *Verticordia* but Holm (1988) has published many preliminary observations on floral development and possible pollinators. A wide range of insects has been observed on *Verticordia*, including flies, wasps, bees, bugs and beetles (personal observations, T. Houston, A. Baines & M.E. Trudgen, pers. comm.). Here is a fascinating subject awaiting investigation.

Because the anthers proved to have features usually diagnostic for species but are very small, a study was made using a scanning electron microscope. The material was mostly fixed in formalin-acetic-alcohol, then critical-point dried and gold coated. A selection of species from all sections of the genus except sect. *Elachoschista* was studied.

In subg. *Chrysoma*, the anther is swollen adaxially, while the connective is broad and produced apically into a usually prominent appendage (Figures 1, 2, 3A & B). There are two pores towards the apex of the locules. Between them at the base of the appendage is a small protuberance. Its function is unclear, but it appears to rupture as the pollen is extruded and may be the point through which the pollenkitt that loosely binds the pollen grains is extruded. This substance appears to form within the connective, which is smooth and rounded before anthesis but depressed afterwards. Likewise the anther locules are smooth before anthesis but after extrusion of the pollen are shrunken with a rather ruminate pattern (Figures 1 G & H, 2 B & C, 3 A & B). Initially the pollen remains loosely piled on top of the anther (Figure 1C), the appendage in a number of species probably acting as a collector until the pollen is removed.

The size and form of the appendage varies greatly. A concave, entire or emarginate form is typical (Figure 1). In a few species, e.g. *V. citrella, V. subulata,* it is greatly reduced. In sect. *Sigalantha* it is large and infolded (Figure 2 A & B), while in sect. *Unguiculata* it is extended as two long horns (Figure 2 C). In sect. *Chrysorhoe* it is expanded to partly cover the apex of the anther, but the apex of the appendage is contracted and infolded like a small proboscis (Figure 2 F & G). The extreme expansion is in sect. *Cooloomia*, where the appendage forms two wings adnate to the anther to its base and curved across the front so as to almost enclose it within coarsely fimbriate margins (Figure 2 D & E).

In some species of subg. *Chrysoma* the stamens remain in the same position from anthesis, but in others they spread widely at first and later curve over the centre of the flower.

In subg. *Verticordia* there is considerable variety of form and orientation of the anthers (Figures 3 C to 6 F). The anther is basically globular and basally attached. Usually it is turned adaxially, with the pores on the inner or upper face. The connective is not produced into an appendage or at most forms a small swelling, e.g. sect. *Corymbiformis*, sect. *Intricata*. In some species the anther is vertically compressed, e.g. *V. gracilis, V. eriocephala*.

In sect. *Intricata* the anther is erect on the filament, the pores are adaxial and shortly slit-like before anthesis, with a nose-like swelling of the connective between them (Figure 6 A to C).

Extrusion of the pollen in subg. *Verticordia* is through two pores, but in several species (e.g. in sect. *Corymbiformis* (Figure 4 D to F) and sect. *Micrantha* (Figure 3 I)) the pores appear to coalesce or almost so. The pores are sometimes elongated before opening, showing a tendency towards the slits of subg. *Eperephes*. Shrinkage of the anther occurs in this subgenus also, but not as markedly as in subg. *Chrysoma*. The surface is then finely rugose or reticulate and the small appendage, where present, also rugose.

As in subg. *Chrysoma*, the stamens in some species of subg. *Verticordia* are erect or spreading at anthesis and then quickly curved over the centre of the flower. In other species they remain in the erect or spreading position.

Subg. *Eperephes* has far more uniform anthers than the other subgenera (Figures 6 G to 7). The anther is expanded adaxially and opens by two slits along almost its full length. The connective is usually swollen dorsally but not produced into an appendage. There is usually a prominent groove between the locules. In many species the filament is recurved at the apex so that the anther faces upwards or even outwards.

In sect. *Integripetala* the locules are turned downwards such that the slits are almost vertical on the adaxial face (Figure 6 G to I). The filament apex is greatly enlarged.

Sect. *Tropica* (Figure 6 J to L) is perhaps a link between subg. *Eperephes* and subg. *Verticordia*, especially sect. *Intricata*. The connective apex is nose-like in both sections, and the slit-like pores in sect. *Intricata* are tending towards the long slits of sect. *Tropica*. After anthesis, however, the openings in sect. *Intricata* appear as pores, not slits.

Style. Although the style is simple, it shows a variety of form. In most species of subg. *Chrysoma* and subg. *Verticordia* it is straight and central, included or exserted. Some species have a gently curved style or a geniculate apex. In most species of subg. *Eperephes* the style is curved in the upper part and in some species it is excentrically inserted on the hypanthium.

All species of subg. *Chrysoma* have a glabrous style, as do some of subg. *Verticordia*. Most species of subg. *Verticordia* have a beard either just below the stigma or extending well down the style (Figures 8, 9). The hairs are simple (Figure 8 A to E) though sometimes with swollen apices, except in *V. pritzelii* and *V. gracilis* (Figure 8 G & H) which have shortly forked hairs. All species of subg. *Eperephes* have a beard usually just below the apex, usually of forked hairs (Figure 9). In *V. jamiesonii* the beard is in the lower half, while in sect. *Tropica* it forms a narrow ring immediately

below the stigma. The hairs of the style appear to serve as a pollen collector and presenter, receiving pollen extruded by the anthers.

The stigma is usually small, but is capitate in several species, notably *V. huegelii* and *V. multiflora*. It is formed of prominently convex cells (Figures 8 A, C & H, 9 B & F).

In subg. *Verticordia* and subg. *Chrysoma*, the style when exserted shows remarkable elongation. Before anthesis it is very short, not exceeding the androecium. When the flower opens it elongates rapidily and reaches its full length within a few hours. This has been observed, for example, in *V. mitchelliana* and *V. capillaris*. In these species the flower opens in the evening, with the petals spreading widely and the style short. By early the next morning, the style has elongated and the petals have closed over the centre of the flower.

The style in subg. *Eperephes* is fully elongated or almost so by anthesis. In the bud it is once folded on itself and simply unfolds as the flower opens. There is one exception, *V. grandis*. In this species the style is tightly rolled in the bud, and uncoils circinnately at anthesis.

Ovary. The ovary is unilocular. It may occupy the whole hypanthium or be located towards either the base or the apex. There are 1-13 ovules. In subg. *Chrysoma* there are 1 or 2 ovules laterally attached at the base of the ovary. In subg. *Verticordia* there are usually 1-3 ovules but occasionally as many as 5, also laterally attached at the base. Subg. *Eperephes* has 6-13 ovules on a basal peltate placenta.

Fruit. The *Verticordia* fruit is dry and nut-like, enclosed within the faded perianth. It usually contains a single seed, occasionally 2. Externally a fruit is difficult to distinguish from a faded flower containing no seed. The present review has included no study of fruit.

Flower colour and scent. For most taxa, colour is relatively consistent and is a useful diagnostic character, though in some sections such as *Chrysoma* and *Verticordella* the differences are subtle. Most species have brightly coloured sepals, petals, androecium and style. The principal colours are yellow, pink, red, orange, cream and white. The brightly-coloured taxa have various forms of sweet scent or none. A few taxa have dull flowers, notably *V. oxylepis*, *V. longistylis* and *V. fastigiata*; these have a pungent, unpleasant scent and may be pollinated by small marsupials.

While in some taxa the colour simply fades as the flowers age, in others there is a marked change. Many taxa of sect. *Chrysoma*, sect. *Jugata*, sect. *Unguiculata*, and sect. *Pilocosta* have yellow flowers that turn deep red; some forms of *V. picta* and *V. chrysostachys* also turn deep red. *V. serrata* changes from golden to grey. These changes apparently occur after removal of pollen and loss of stigma receptivity, whether or not pollination has occurred, and may well be a device to reduce attraction to potential pollinators which will concentrate on still-fresh flowers (Lamont 1985).

Phenology. Most south-western taxa flower in spring and summer. A few taxa begin to flower in late August and September but the greatest number is in flower from October to December. Quite a few continue well into summer while some taxa flower only in summer and autumn. *Verticordia pityrhops* and *V. lehmannii* continue into winter, at which season *V. staminosa* is the only species in full flower. The north-western and tropical species flower from July to October.

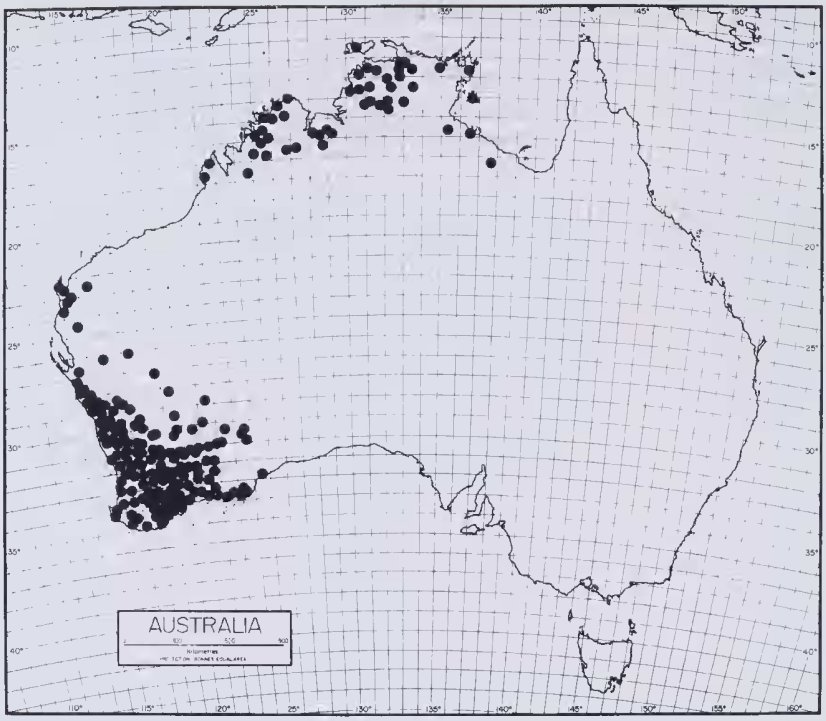

Figure 11. Distribution of *Verticordia*.

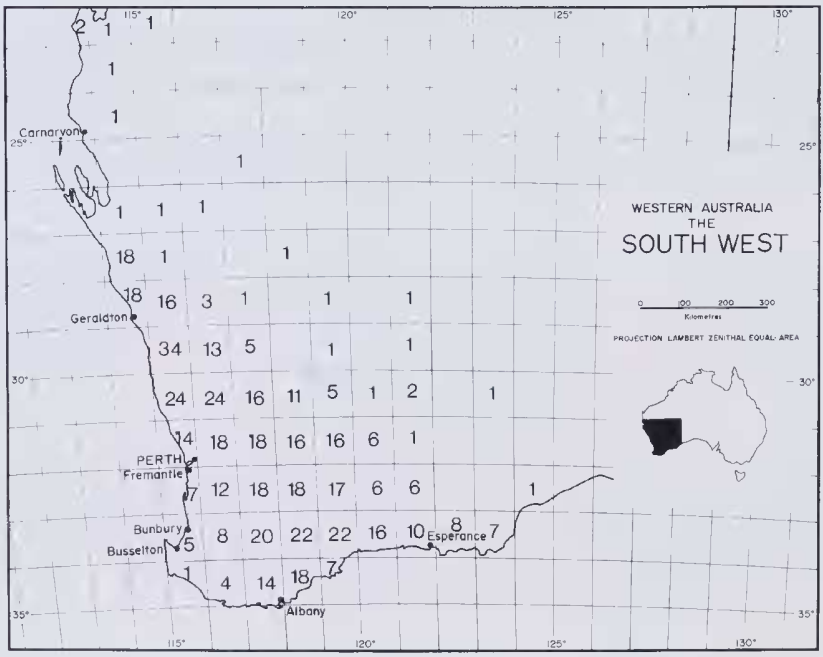

Figure 12. Number of species of *Verticordia* per 1° x 1° grid in southern Western Australia.

Geographical distribution

The geographical distribution of *Verticordia* is shown in Figure 11. The genus occurs predominantly in the South West Botanical Province of Western Australia, where there are 90 species, several of which extend into the Eremaean Province; one species is confined to the southern Eremaean Province; three further species occur in north-western Australia and a further three occur in the Kimberley and Northern Territory.

Figure 12 gives the number of species within the 1^0 x 1^0 grid of southern Western Australia. The figures are the number of species recorded. Infraspecific taxa were amalgamated as species for this exercise. Within the South West Botanical Province the figures demonstrate the preference of species for the regions of moderate rainfall between the wetter south-western corner of the continent and the transition to the Eremaean Province. The highest concentration is in the grid centred on Eneabba in the upper south west, where 34 species have been recorded; nineteen species have been recorded within 20 km of Eneabba. Across the heathlands generally there is a relatively even distribution with 16-24 species per grid, but there is some increase in the area south and south-east of Eneabba and in the area north and north-east of the Stirling Range. The increase is less marked than that of some genera in the south-western flora where there are two areas of high species richness, one to the north of Perth and one to the south-east, e.g. *Dryandra* (Griffin 1985) .

The distribution of some infrageneric taxa may be highlighted. Subgenera *Chrysoma* and *Verticordia* are entirely south-western. Within this region, sect. *Chrysoma*, sect. *Verticordia* and sect. *Corymbiformis* are widespread, while other sections are restricted to varying degrees, e.g. sect. *Chrysorhoe* occurs near the lower west coast between Bunbury and Eneabba; sect. *Cooloomia* occurs between the lower Murchison River and Shark Bay; sections *Micrantha* and *Infuscata* occur along the south coast between Cape Riche and Israelite Bay. A wider distribution is shown by subg. *Eperephes* which includes sect. *Tropica* in the Kimberley and the Northern Territory, sect. *Jamiesoniana* with one species in the upper Murchison-Gascoyne areas, sect. *Integripetala* which extends from the South West Province well into the Eremaean, and the very widespread sect. *Verticordella*. Sect. *Pennuligera* occurs only to the north of Perth and includes the two species in the north west. No doubt these distribution patterns will be reflected, at least to some extent, in those of the pollinators when known.

Cytology

The findings reported by Rye (1979) may be re-interpreted in light of the present review. The voucher collections from that study have been checked, necessitating some redeterminations (Table 1).

In terms of generic and infrageneric classification, chromosome numbers, taken in conjunction with the morphology, do not support a generic split but do, in general, match the proposed infrageneric classification.

All taxa of subg. *Eperephes* counted have n = 11 or 22, including *V. picta* which is here considered a link with subg. *Verticordia*. While the latter subgenus has four numbers (n = 6, 8, 9, 11) the species with 11, *V. plumosa*, is not closely related to any species of subg. *Eperephes*. Species of subg.

Verticordia here considered related to subg. *Eperephes* include *V. pritzelii* (n = 9) and *V. humilis* (2n = 16).

Subg. *Chrysoma* has n = 6, 7, 8 and 16, yet taxa of this subgenus are more cohesive morphologically than are those of the other subgenera. From this it would appear that chromosome number in itself is not a strong character at subgeneric level.

Rye's vouchers cover 27 species of the 97 now recognised. In view of the large increase in the number of taxa, a further study of chromosome numbers is warranted.

Table 1. Revised determinations of vouchers for chromosome numbers in *Verticordia*, cited by Rye (1979).

Taxon	Number	Voucher	
subg. *Chrysoma*			
sect. *Chrysoma*			
V. acerosa var. *acerosa*	2n= 16	*Powell*	73035
V. acerosa var. *preissii*	n= 8	*Powell*	74053
V. endlicheriana var. *major*	n = 16	*Powell*	74122
sect. *Jugata*			
V. chrysanthella	n = 8	*Powell*	74035
V. chrysanthella	2n = 16	*Powell*	73041
V. chrysanthella	2n = 16	*Powell*	74026
V. chrysanthella	n = 16	*Powell*	74070
V. chrysantha	n = 16	*Powell*	74059
V. chrysantha	n = 16	*Powell*	74032
V. chrysantha	n = 16	*Powell*	74061
V. chrysantha	n = 16	*Powell*	74036
sect. *Unguiculata*			
V. nobilis	2n = 12	*Powell*	74095
V. nobilis	2n = 12	*Powell*	74100a
V. nobilis	2n = 12	*Powell*	74100b
V. nobilis	2n = 12	*Powell*	73044
V. grandiflora	2n = 12	*Powell*	76037
sect. *Sigalantha*			
V. serrata var. *serrata*	2n = 14	*Powell*	73053
V. serrata var. *serrata*	n = 7	*Powell*	74112
sect. *Chrysorhoe*			
V. nitens	2n = 16	*Powell*	73052
V. patens	n = 8	*Powell*	74040
subg. *Verticordia*			
sect. *Verticordia*			
V. plumosa var. *plumosa*	n = 11	*Rye*	76002
sect. *Corymbiformis*			
V. polytricha	2n = 12	*Powell*	74144
V. densiflora var. *densiflora*	n = 6	*Powell*	74105
V. densiflora var. *cespitosa*	n = 12	*Rye*	77002
V. densiflora var. *?roseostella*	n = 6	*Powell*	74096
V. densiflora var. *stelluligera*	n = 6	*Powell*	74069
V. densiflora var. *stelluligera*	n = 6	*Powell*	74071
V. densiflora var. *stelluligera*	n = 6	*Powell*	74076
sect. *Micrantha*			
V. minutiflora	2n = 16	*Powell*	73049
sect. *Pilocosta*			
V. huegelii var. *huegelii*	2n = 16	*Powell*	73047

Table 1 (continued). Revised determinations of vouchers for chromosome numbers in *Verticordia*, cited by Rye (1979).

Taxon	Number	Voucher	
V. huegelii var. *huegelii*	2n = 16	*Powell*	74016
V. brachypoda	n = 8	*Powell*	73037
V. brachypoda	n = 8	*Powell*	74127
V. multiflora subsp. *multiflora*	2n = 16	*Powell*	73051
sect. *Catocalypta*			
V. roei subsp. *roei*	n = 9	*Powell*	74109
V. roei subsp. *roei*	n = 9	*Powell*	7601
V. roei subsp. *roei*	n = 9	*Powell*	76012
sect. *Recondita*			
V. humilis	2n = 16	*Trudgen*	73048
sect. *Intricata*			
V. monadelpha var. *monadelpha*	2n = 12	*Powell*	73050
V. monadelpha var. *callitricha*	2n = 12	*Powell*	74001
V. monadelpha var. *callitricha*	2n = 12	*Powell*	74094
V. monadelpha var. *callitricha*	2n = 12	*Powell*	74098
V. mitchelliana	n = 9	*Powell*	74125
V. pritzelii	n = 9	*Rye*	77024
subg. *Eperephes*			
sect. *Integripetala*			
V. picta	2n =c.22	*Powell*	73034
V. picta	n = 11	*Powell*	74050
V. picta	n = 11	*Powell*	74081
sect. *Verticordella*			
V. lindleyi subsp. *lindleyi*	n = 11	*Powell*	73031
V. pennigera	2n =c.44	*Powell*	74039
V. pennigera	n =c.22	*Powell*	74128
sect. *Pennuligera*			
V. lepidophylla var. *lepidophylla*	n = 11	*Powell*	74004
		Powell	74093
V. etheliana var. *etheliana*	n = 11	*Powell*	74089
V. grandis	n = 22	*Powell*	73029

Hybrids

Several presumed hybrids have been recorded in *Verticordia*. The plants are intermediate in morphology between the probable parents which, in most cases, were recorded at the same locality. Several populations appear to be hybrid swarms, since the plants show considerable variation.

Pairs of species for which hybrids are recorded are:

1. *V. densiflora* x *V. eriocephala* - SE of Dowerin, 7 Dec. 1983, *M. Smith* 113 (PERTH), a single plant; several other collections from Mt Lesueur to Nyabing.

2. *V. nobilis* x *V. laciniata*, e.g. Tathra National Park, 17 Oct. 1984, *A.S. George* 16357 & *E.A. Berndt* (PERTH); also near Brand Highway/Coorow-Green Head Road junction.

3. *V. chrysostachys* var. *pallida* x *V. muelleriana* subsp. *minor* - Wicherina, E of Geraldton, 21 Nov. 1987, *B. Wemm*, a hybrid swarm, very variable.

4. *V. spicata* var. *squamosa* x *V. comosa* - NE of Three Springs, 28 Nov. 1985, *C. Chapman* 58, several plants, with both presumed parents present in area.

5. *V. oculata* ? x *V. etheliana* - near the Loop, Kalbarri National Park, 11 Nov. 1984, *R. & B. Wemm* 32 (PERTH), a single plant in a population of *V. oculata*.

6. *V. roei* subsp. *roei* x *V. inclusa* - South Burngup Road, SW of Newdegate, 11 Oct. 1981, *E. Berndt* 32 (PERTH), a single plant in a population of *V. inclusa*, with *V. roei* in vicinity.

Further research

While the present work resolves many taxonomic issues in *Verticordia*, much work remains to be done. Many taxa recognised here are clearly distinct (e.g. subg. *Chrysoma*, sect. *Chrysorhoe*, *V. cooloomia*). Others are somewhat heterogeneous (e.g. subg. *Eperephes* and sect. *Intricata*). A number of collections are still unplaced, in most cases due to inadequate material. Some of these are cited below, under the taxonomically nearest species.

In particular, several species and species-groups should be studied further in order to clarify taxa and relationships. Particular attention should be given to *V. plumosa*, *V. densiflora*, *V. acerosa*, the *chrysantha* group, *V. monadelpha*, sect. *Verticordella* and the *chrysostachys-muelleriana* group.

Aspects worthy of special study include cytology, pollination, flower ontogeny and seed development.

Verticordia

Verticordia DC., Prodr. 3: 208 (1828). - *Diplachne* sect. *Verticordia* (DC.) Kuntze, Lex. Gen. Phan. 177 (1903). *Type: V. fontanesii* DC. [= *V. plumosa* (Desf.) Druce].

Chrysorhoe Lindley, Comp. Bot. Mag. 2: 357 (1836). *Type: C. nitens* Lindley [= *V. nitens* (Lindley) Endl].

Shrubs or in 2 species small trees, usually fire-sensitive, sometimes with a small lignotuber. Leaves opposite, rarely whorled or scattered, exstipulate, the floral leaves often somewhat different from the vegetative ones. Inflorescence an axillary pedunculate monad with a pair of free or united prophylls (bracteoles), usually in crowded upper axils and forming corymb-, raceme- or spike-like arrangements. Prophylls scarious, deciduous or persistent. Hypanthium present, turbinate or hemispherical, occasionally vertically compressed, sometimes constricted at apex or near middle, in subg. *Eperephes* usually with 5 green reflexed appendages at the apex. Sepals 5, imbricate, deeply divided into 5-15 plumose, fimbriate or erose lobes, rarely scarcely divided and lacerate to erose, with or without basal fimbriate auricles and in subg. *Eperephes* also with 5 reflexed lobes (3 sepals each with 1, 1 with 2 and 1 with 0) bearing a ciliate, fimbriate or comose lamina. Petals 5, imbricate, free or united with androecium, concave, fimbriate to erose, rarely entire, often pubescent to scabrid. Androecium of 10 stamens alternating with 10 staminodes, in 2 species of 5 stamens and 15 staminodes, free or variously united; filaments terete to compressed, of equal length or alternately

long and short; anthers 2-locular, not versatile, saccate or globular and opening by pores or short slits, or oblong and opening by slits; connective often produced above anther; staminodes terete, compressed or flat, sometimes lobed or divided, often glandular-warted, hairy or fimbriate. Style central, occasionally excentric, included or exserted, straight, curved or geniculate, glabrous or bearded with branched or simple hairs; stigma small, occasionally capitate. Ovary unilocular; ovules 1-13, basally attached either laterally or on a peltate placenta. Fruit dry and nut-like, enclosed within the persistent faded flower, 1- or 2-seeded.

The traditional circumscription of the genus *Verticordia* is maintained here, except that *V. wilhelmii* is retained in *Homoranthus* to which it was transferred by Cheel in 1922. *Verticordia* is characterised especially by the sepals being usually divided into fimbriate or plumose segments, petals usually of similar size to the sepals and usually fimbriate or digitately lobed, and 10 stamens alternating with 10 staminodes, with basifixed or dorsifixed bilocular anthers. The closest generic relatives of *Verticordia* are *Darwinia*, *Chamelaucium* and *Homoranthus*. In these genera the sepals are small with an opaque lamina and scarious margins that are trifid, ciliate or entire. The petals are of more succulent texture than are those of *Verticordia* and are usually entire. In *Darwinia* and *Chamelaucium* the hypanthium is usually narrowly turbinate to almost cylindrical. All species of *Darwinia* and some *Homoranthus* have inflorescences of several flowers, in *Darwinia* usually with an involucre.

It has been suggested, e.g. Rye (1979), Briggs & Johnson (1979), Johnson & Briggs (1984), that *Verticordia* be divided into 2 genera, namely *Verticordia sensu stricto* and '*Catocalypta*', the latter being the taxon described below as subg. *Eperephes*. As explained below, the name *Catocalypta* has been wrongly applied in the sense of all authors from Bentham (1867) onwards. The genus is much more complex than is implied by this suggestion, however, and if it were to be divided it would be into more than 2 genera. The infrageneric classification given below indicates the complexity. Much more research is needed before any formal generic split should be made. A comprehensive cytological study including the many new species here described would be useful. As mentioned in the section Cytology (above), the counts so far made do not support a generic breakup. As explained below, there are links between the subgenera here proposed, and also between several sections.

Synoptic key to infrageneric taxa

1a Ovules 1-5; anthers globular or saccate, opening by pores; hypanthium without green reflexed appendages; leaves often dimorphic

2a Anthers saccate, the connective produced into an apical appendage; style glabrous; hypanthium glabrous; leaves flattened, linear or terete; flowers yellow, often turning red with age ..... subg. *Chrysoma*

3a Bracteoles caducous at or before anthesis

4a Petals digitately lobed, the surfaces not shining; hypanthium turbinate, ribbed ..... sect. *Chrysoma*

4b Petals dentate, erose or entire, the surfaces shining; hypanthium ± hemispherical, not or obscurely ribbed

5a Anther appendage entire, not or only partly enclosing anther loculcs; floral leaves linear, terete, obovate, elliptic or linear; sepals prominently plumose

6a Staminodes broadly oblong, obtuse, entire; leaves obovate, elliptic or oblong ..... sect. *Sigalantha*

6b Staminodes narrowly triangular, subulate to acute, sometimes lobed; leaves narrowly linear-terete ..... sect. *Chrysorhoe*

5b Anther appendage ciliate, enclosing anther locules; floral leaves orbicular; sepals shortly fimbriate ..... sect. *Cooloomia*

3b Bracteoles persistent

7a Anther appendage entire or bilobed

8a Stamens and staminodes free or shortly united; staminodes flat, obtuse or acute ..... sect. *Jugata*

8b Stamens and staminodes united in a prominent tube; stamens subulate ..... sect. *Synandra*

7b Anther appendage deeply bifurcate ..... sect. *Unguiculata*

2b Anthers globular, erect or turned adaxially, the pores in some species shortly slit-like before dehiscence, sometimes appearing confluent; connective not produced, in some species apically swollen; style hairy or glabrous; hypanthium variously hairy; leaves linear to oblong ..... subg. *Verticordia*

9a Sepals divided into plumose or fimbriate lobes, or into parallel to slightly divergent fimbriae, rarely not lobed and almost entire

10a Sepals without auricles

11a Sepals divided into plumose, erose or fimbriate lobes

12a Sepal lobes plumose to erose ..... sect. *Verticordia*

12b Sepal lobes fimbriate

13a Sepals 3-3.5 mm long; hypanthium broadly turbinate or constricted, not ribbed ..... sect. *Corymbiformis*

13b Sepals 2-2.5 mm long; hypanthium narrowly turbinate, 5-ribbed ..... sect. *Micrantha*

11b Sepals deeply divided, mostly into simple rigid scabrid spreading fimbriae, rarely not lobed and almost entire

14a Style shortly exserted, with a short dense beard of forked hairs; flowers deep pink ..... sect. *Platandra*

14b Style long-exserted, with a ± sparse beard of simple hairs; flowers red, or pink and cream, or cream and purple

15a Flowers ± pendulous, red; petals without translucent margins; anthers out-turned; hypanthium not comose at base ..... sect. *Recondita*

15b Flowers erect or spreading, cream and pink or cream and purple; petals with translucent margins; anthers in-turned; hypanthium comose at base

16a Sepals deeply fimbriate ..... sect. *Infuscata*

16b Sepals not lobed, almost entire ..... sect. *Elachoschista*

10b Sepals with clawed auricles ..... sect. *Catocalypta*

9b Sepals intricately and divaricately divided

17a Sepals without clawed auricles; leaves linear-clavate

18a Staminodes fringed or lobed; leaves entire ..... sect. *Pilocosta*

18b Staminodes entire; leaves erose ..... sect. *Penicillaris*

17b Sepals with clawed auricles; leaves semiterete ..... sect. *Intricata*

1b Ovules 6-13; anthers oblong to obovoid, attached basally with a swollen filament apex, opening by slits; hypanthium usually with 5 green reflexed appendages ..... subg. *Eperephes*

19a Leaves linear, terete or triquetrous, entire, without translucent margins; hypanthium without reflexed appendages from apex

20a Petals entire; style shortly bearded just below stigma ..... sect. *Integripetala*

20b Petals lacerated; style beard a ring subtending the stigma ..... sect. *Tropica*

19b Leaves orbicular, ovate, elliptic or oblong, flat, concave or semiterete, entire, erose or ciliate; hypanthium usually with 5 reflexed green appendages from apex

21a Sepals with fimbriate lobes, without peltate auricles but usually with small basal auricles or reflexed cilia; petals without basal auricles; leaves ovate, elliptic or oblong, erose or ciliate, occasionally entire; bracteoles caducous

22a Staminodes linear to narrowly lanceolate or triangular

23a Hypanthium with 5 green reflexed appendages; stamens and staminodes glabrous; style bearded below apex ..... sect. *Verticordella*

23b Hypanthium without reflexed appendages; stamens and staminodes pilose; style bearded towards base ..... sect. *Jamiesoniana*

22b Staminodes clavate ..... sect. *Corynatoca*

21b Sepals with plumose lobes and with peltate basal auricles ± covering hypanthium; petals with small basal auricles; leaves orbicular, usually entire; bracteoles persistent ..... sect. *Pennuligera*

Key to infrageneric taxa and species

1a Ovules 1-5; anthers globular or saccate, opening by pores; hypanthium without green reflexed appendages

2a Anthers saccate, the connective produced into an apical appendage; style glabrous; hypanthium glabrous; leaves flattened or linear ..... subg. *Chrysoma* Schauer

3a Bracteoles persistent

4a Anther appendage deeply bifurcate; stamens alternately short and long ..... sect. *Unguiculata* A.S. George

5a Stamens erect, 2 and 4 mm long; style exserted or level with anthers; upper leaves 8-12 mm long; no short lateral upper branchlets ..... *V. nobilis* Meissner

5b Stamens inflexed, 1-2 and 2-2.5 mm long; style included; upper leaves 3-7 mm long; short lateral upper branchlets with crowded leaves present

6a Staminodes with 1 (rarely 3) lobes each side; sepals 5-6 mm long; petals 5-6 mm long; style 0.8-1 mm long; Brookton to Ravensthorpe ..... *V. grandiflora* Endl.

6b Staminodes fringed each side; sepals 4.5-5 mm long; petals 4 mm long; style 0.2 mm long; Mt Lesueur to Badgingarra area ..... *V. rutilastra* A.S. George

4b Anther appendage entire or bilobed

7a Stamens and staminodes united in a prominent tube; staminodes narrowly linear, subulate or obtuse ..... sect. *Synandra* A.S. George ..... *V. staminosa* A.S. George

7b Stamens and staminodes free or shortly united; staminodes oblong, lanceolate or triangular, obtuse or acute ..... sect. *Jugata* A.S. George

8a Staminodes entire

9a Anther appendage gently concave to plicate; peduncles usually less than 12 mm long; southern and widespread species

10a Anther locule and appendage of equal length

11a Staminodes 1-1.5 mm wide; style 4 mm long ..... *V. coronata* A.S. George

11b Staminodes 0.3-0.7 mm wide, obtuse to acute; style 1-2.5 mm long ..... *V. brevifolia* A.S. George

10b Anther locule longer than appendage

12a Sepals and petals 3-3.5 mm long; leaves 3-8 mm long, uncinate ..... *V. chrysanthella* A.S. George

12b Sepals 4-7 mm long; petals 4-6 mm long; leaves 5-15 mm long, usually not uncinate ..... *V. chrysantha* Endl.

9b Anther appendage inflated, hood-like; peduncles 12-20 mm long; lower Murchison River ..... *V. galeata* A.S. George

8b Staminodes lobed or fringed

13a Staminodes fringed; leaves shortly ciliate ..... *V. laciniata* A.S. George

13b Staminodes lobed; leaves entire

14a Bracteoles fringed; staminodes narrowly triangular ..... *V. amphigia* A.S. George

14b Bracteoles entire; staminodes broadly linear to lanceolate

15a Leaves 5-15 mm long, smooth; sepals 4-7 mm long; petals 4-6 mm long ..... *V. chrysantha* Endl.

15b Leaves 3-8 mm long, often warty; sepals 3-3.5 mm long; petals 3-3.5 mm long .. *V. chrysanthella* A.S. George

3b Bracteoles caducous at or before anthesis

16a Petals digitately lobed, the surfaces not shining; hypanthium turbinate, ribbed ..... sect. *Chrysoma* (Schauer) A.S. George

17a Staminodes subulate, entire or rarely 1- or 2-lobed; style 0.5-1 mm long ..... *V. subulata* A.S. George

17b Staminodes linear, lanceolate or oblong, fringed, lobed or if entire then obtuse

18a Staminodes entire, obtuse ..... *V. endlicheriana* Schauer

18b Staminodes lobed or fringed

19a Sepals 2.5-3 mm long, spreading; petals 3.5-4 mm long; style 2-2.8 mm long ..... *V. acerosa* Lindley

19b Sepals 2 mm long, reflexed; petals 1.5-1.8 mm long; style 0.8 mm long ..... *V. citrella* A.S. George

16b Petals dentate, erose or entire, the surfaces shining; hypanthium hemispherical, not or obscurely ribbed

20a Anther appendage entire, not or only partly enclosing anther locules; floral leaves linear, terete, obovate, elliptic or linear; sepals prominently plumose

21a Staminodes broadly oblong, obtuse, entire; leaves obovate, elliptic or oblong, concave ..... sect. *Sigalantha* A.S. George

22a Leaves ciliate; petals obovate to cuneate, dentate, 1-2 mm wide ..... *V. serrata* Lindley

22b Leaves entire; petals orbicular, entire, 3-3.5 mm diam. ..... *V. integra* A.S. George

21b Staminodes narrowly triangular, subulate to acute, sometimes lobed; leaves narrowly linear, terete ..... sect. *Chrysorhoe* (Lindley) A.S. George

23a Sepals 2.5-3 mm long, with prominent auricles; petals 2 mm long; flowers lemon yellow ..... *V. patens* A.S. George

23b Sepals 4-5 mm long, with a few reflexed cilia but no auricles; petals 3-4.5 mm long; flowers bright orange or golden

24a Flowers bright orange; sepals 4 mm long; petals 3 mm long; staminodes linear; Regans Ford to Perth, and Harvey area ..... *V. nitens* (Lindley) Endl.

24b Flowers golden; sepals 4-4.5 mm long; petals 4-5 mm long; staminodes narrowly ovate; Eneabba area ..... *V. aurea* A.S. George

20b Anther appendage ciliate, enclosing anther locules; floral leaves orbicular; sepals shortly fimbriate; N of lower Murchison River ..... sect. *Cooloomia* A.S. George *V. cooloomia* A.S. George

2b Anthers ± globular, erect or turned adaxially, the pores in some species shortly slit-like before dehiscence, sometimes appearing confluent; connective not produced, in some taxa apically swollen; style hairy or glabrous; hypanthium variously hairy; leaves linear to oblong ..... subg. *Verticordia*

25a Sepals with plumose or fimbriate lobes, or deeply divided into parallel to slightly diverging fimbriae

26a Sepals without auricles

27a Sepals divided into plumose, erose or fimbriate lobes

28a Sepal lobes plumose to erose

29a Staminodes fringed

30a Style exserted, 5 mm long

31a Dense, pine-like shrub; sepals 2-2.3 mm long; petals 2 mm long; East Mt Barren ..... *V. pityrhops* A.S.George

31b Open shrub with widely spaced corymb-like flower groups; sepals 4 mm long; petals 2.3-2.5 mm long; Manypeaks area ..... *V. harveyi* Benth.

30b Style included, 0.2-0.3 mm long ..... *V. fimbrilepis* Turcz.

29b Staminodes entire, often with prominent oil glands

32a Style long-exserted, 13-22 mm long, with an inconspicuous beard; flowers pale yellow

33a Leaves clavate, obtuse, 3-6 mm long, the petiole 0.5-1 mm long; petals pubescent ..... *V. helichrysantha* F. Muell. ex Benth.

33b Leaves linear, acute, 4-14 mm long, the petiole 1-2.5 mm long; petals glabrous ..... *V. crebra* A.S. George

32b Style not or shortly exserted, 4-7 mm long, with a short but readily evident beard; flowers pink to white

34a Sepal lobes with midrib usually 0.4-0.7 mm at widest point, ± irregularly but shortly plumose to erose ..... *V. plumosa* (Desf.) Druce

34b Sepal lobes with midrib c. 0.2 mm at widest point, deeply plumose

35a Petals orbicular, 2-2.5 mm long; style 5-6 mm long; flowers pale to medium pink; south coast and inland to Mt Holland ..... *V. sieberi* Diesing ex Schauer

35b Petals ovate, 3-3.5 mm long; style 6-7 mm long; flowers deep pink; Southern Cross-Bullabulling-Forrestania area ..... *V. stenopetala* Diels

28b Sepal lobes fimbriate

36a Sepals 3-3.5 mm long; hypanthium broadly turbinate or constricted, not ribbed ..... sect. *Corymbiformis* A.S. George

37a Hypanthium constricted at about the middle

38a Petals glabrous; central and southern south-western districts

39a Flowers white or cream; style 3.5-4 mm long, glabrous..... *V. eriocephala* A.S. George

39b Flowers pink; style 5-6 mm long, bearded below apex ..... *V. brownii* (Desf.) DC.

38b Petals shortly pubescent outside; Kalbarri to Mullewa ..... *V. capillaris* A.S. George

37b Hypanthium not constricted

40a Leaves lanceolate, elliptic or ovate, concave; sepals appearing prominently clawed after anthesis; style curved towards apex with surrounding beard; flowers pink or pale yellow ..... *V. densiflora* Lindley

40b Leaves linear, semiterete; sepals not appearing clawed; style with kink and short unilateral beard just below apex; flowers cream-white ..... *V. polytricha* Benth.

36b Sepals 2-2.5 mm long; hypanthium narrowly turbinate, 5-ribbed ..... sect. *Micrantha* A.S. George

41a Staminodes minute, often absent; flowers white to very pale pink ..... *V. minutiflora* F. Muell.

41b Staminodes clearly evident, as long as or exceeding stamens; flowers pink, yellow or deep red

42a Bracteoles caducous; peduncles 1-2 mm long; petals glabrous, shining; flowers deep red to deep yellow; Cape Riche to Hamersley River ..... *V. fastigiata* Turcz.

42b Bracteoles persistent; flowers almost sessile; petals shortly pubescent; flowers pink or pale yellow; Hopetoun to Israelite Bay ..... *V. vicinella* A.S. George

27b Sepals deeply divided, mostly into simple, ± rigid scabrid widely spreading fimbriae, rarely not lobed and almost entire

43a Style shortly exserted, with a short, dense beard of forked hairs; flowers deep pink; Merredin to Hyden ..... sect. *Platandra* A.S. George, *V. gracilis* A.S. George

43b Style long exserted, with a ± sparse beard of simple hairs; flowers red, or cream and pink, or cream and purple; Lake Grace to south coast

44a Flowers pendulous, red; petals without translucent margins; anthers out-turned ..... sect. *Recondita* A.S. George, *V. humilis* Benth.

44b Flowers erect or spreading, cream and pink, or cream and purple; petals with translucent margins; anthers in-turned

45a Sepals deeply fimbriate ..... sect. *Infuscata* A.S. George

46a Style 6-7 mm long; sepals 3-4 mm long; petals 1.7-2 mm long, shortly ciliate; stamens shorter than staminodes; main branches horizontal ..... *V. oxylepis* Turcz.

46b Style 27-32 mm long; sepals 6-7 mm long; petals 2.5-3 mm long, densely fimbriate; stamens longer than staminodes; main branches ascending irregularly ..... *V. longistylis* A.S. George

45b Sepals not lobed, almost entire ..... sect. *Elachoschista* A.S. George ..... *V. verticordina* (F. Muell.) A.S. George

26b Sepals with clawed auricles ..... sect. *Catocalypta* (Schauer) Meissner

47a Style with lateral beard below stigma

48a Petals shortly fringed around most of margin, the lamina papillose outside; sepal auricle divisions filiform, divaricate; Perenjori to Hyden ..... *V. pritzelii* Diels

48b Petals with long fringe on upper margin, the lateral margins entire; lamina glabrous, shining; sepal auricles with flat lobes that are densely fimbriate; Scott River to Busselton ..... *V. lehmannii* Schauer

47b Style glabrous

49a Petals entire or erose ..... *V. habrantha* Schauer

49b Petals fimbriate

50a Staminodes fimbriate; flowers pink or cream

51a Staminodes with setae on inner face; style 2.5-7 mm long; stamens 2-6 mm long; flowers pink, often red in centre ..... *V. insignis* Endl.

51b Staminodes glabrous on inner face; style 0.2-0.3 mm long; stamens 0.6-0.7 mm long; flowers mainly cream ..... *V. inclusa* A.S. George

50b Staminodes entire or obscurely lobed; flowers creamy white, rarely pink ..... *V. roei* Endl.

25b Sepals intricately and divaricately divided

52a Sepals without clawed auricles; leaves linear-clavate

53a Leaves entire; staminodes fringed, lobed or entire .. sect. *Pilocosta* A.S. George

54a Staminodes fringed or lobed

55a Stigma broadly capitate ..... *V. huegelii* Endl.

55b Stigma not or slightly enlarged ..... *V. brachypoda* Turcz.

54b Staminodes entire, subulate ..... *V. multiflora* Turcz.

53b Leaves erose; staminodes entire ..... sect. *Penicillaris* A.S. George

56a Style 15-19 mm long with purple hairs in upper third; sepal lobes divaricately divided ..... *V. penicillaris* F.Muell.

56b Style 7-9 mm long with white hairs for 2/3-3/4 its length; sepal lobes fimbriate ..... *V. dasystylis* A.S. George

52b Sepals with clawed auricles; leaves semiterete ..... sect. *Intricata* A.S. George

57a Style long-exserted; petals ± free from androecium; flowers red

58a Leaves and branches smooth; style 24-27 mm long; petals 7-8 mm long; stamens and staminodes shortly united ..... *V. mitchelliana* C. Gardner

58b Leaves and branches warty; style 13-15 mm long; petals 3-4 mm long; stamens and staminodes prominently united ..... *V. pulchella* A.S. George

57b Style included to shortly exserted; petals inserted on androecial tube; flowers pink ..... *V. monadelpha* Turcz.

1b Ovules 6-13; anthers oblong to obovoid, attached basally with a swollen filament apex, opening abaxially by slits; hypanthium usually with 5 green reflexed appendages at apex ..... subg. *Eperephes* A.S. George

59a Leaves linear, terete or triquetrous, entire, without translucent margins; hypanthium without reflexed appendages from apex

60a Petals entire; style shortly bearded slightly below stigma; south-western species ..... sect. *Integripetala* A.S. George

61a Stamens 5 fertile

62a Hypanthium not flanged; style hairs acute to obtuse; sepal divisions fimbriate; style hairs not gland-tipped ..... *V. picta* Endl.

62b Hypanthium with a prominent flange descending from apex and almost obscuring body; leaves prominently verrucose; style hairs gland-tipped ..... *V. rennieana* F. Muell.

61b Stamens 10 fertile

63a Flowers deep pink; petals 4-5 mm long, narrowed to basal claw; southern Gascoyne to Laverton ..... *V. interioris* C. Gardner ex A.S. George

63b Flowers cream; petals not clawed, 3-3.5 mm long; leaves glandular smooth; Southern Cross to Queen Victoria Spring ..... *V. helmsii* S.Moore

60b Petals lacerated to dentate; style beard a ring around the stigma; tropical species ..... sect. *Tropica* A.S. George

64a Leaves 7-23 mm long, ± openly arranged; sepals 5-7 mm long

65a Leaves opposite, with prominent oil glands, strongly aromatic when crushed; style 5-7 mm long ..... *V. cunninghamii* Schauer

65b Leaves in whorls of 3 or 4, without prominent oil glands, not aromatic when crushed; style 9-13 mm long ..... *V. verticillata* S.T.Blake ex Byrnes

64b Leaves 2-3 mm long, closely crowded on lateral branchlets; sepals 4-5 mm long ..... *V. decussata* Byrnes

59b Leaves orbicular, ovate, elliptic or oblong, flat, concave or semiterete, entire, erose or ciliate; hypanthium usually with 5 reflexed green appendages from apex

66a Sepal lobes fimbriate, without peltate auricles but usually with small basal auricles or reflexed cilia; petals without basal auricles; leaves ovate, elliptic or oblong, erose or ciliate, occasionally entire; bracteoles caducous, rarely persistent

67a Staminodes clavate ..... sect. *Corynatoca* A.S. George,*V. ovalifolia* Meissner

67b Staminodes linear to narrowly lanceolate or triangular

68a Hypanthium without reflexed appendages; stamens and staminodes pilose; style bearded towards base; upper Murchison areas ..... sect. *Jamiesoniana* A.S. George, *V. jamiesonii* F.Muell.

68b Hypanthium with 5 green reflexed appendages; stamens and staminodes glabrous; style bearded below apex; south-western areas ..... sect. *Verticordella* Meissner

69a Petals entire to dentate, the teeth usually less than 1 mm long

70a Flowers bright red; style 10-12 mm long, the beard of simple hairs ..... *V. hughanii* F. Muell.

70b Flowers mostly pink; style less than 7 mm long, the beard of forked hairs

71a Peduncles 5-7 mm long; 3 upper petals spreading, 2 lower erect and keel-like ..... *V. carinata* Turcz.

71b Peduncles less than 4 mm long; petals spreading equally

72a Petals prominently dentate; leaves oblong, thick

73a Peduncles 1.5-3 mm long; floral leaves similar to stem leaves; stamens and staminodes 1.6-2 mm long; ovules 10 ..... *V. pennigera* Endl.

73b Peduncles 0.5-1 mm long; floral leaves much broader than stem leaves; stamens and staminodes 1.4-1.6 mm long; ovules 6 ..... *V. halophila* A.S. George

72b Petals entire to erose; leaves flat ..... *V. lindleyi* Schauer

69b Petals fimbriate with fine segments more than 1 mm long

74a Sepals 5-6 mm long; petals 4-6.5 mm long

75a Petal fringe or teeth simple but often scabrid

76a Hypanthium 2.5-3.5 mm wide at apex, the reflexed appendages swollen, obtuse; style 3.5-4 mm long; leaves spreading ..... *V. tumida* A.S. George

76b Hypanthium 1.5-2 mm wide at apex, the reflexed appendages ± acute; style 4-8 mm long; leaves ± appressed

77a Petals 4 mm long; style usually 6-8 mm long; flowers pale pink; coastal plain, Perth to Eneabba ..... *V. drummondii* Schauer

77b Petals 5-6 mm long; style 4-5 mm long; flowers bright pink; Wongan Hills district ..... *V. wonganensis* A.S. George

75b Petal fringe itself fimbriate

78a Flowers pink; New Norcia to Gingin

79a Sepals 6 mm long, auriculate; petals 6 mm long; stamens 3 mm long; style 5 mm long; reflexed appendages distinct; bracteoles entire .. *V. bifimbriata* A.S. George

79b Sepals 4 mm long, not auriculate; petals 5 mm long; stamens 1.3-1.5 mm long; reflexed appendages merging into hypanthium; bracteoles ciliate ..... *V. paludosa* A.S. George

78b Flowers yellow or yellow and cream;
Mt Adams to Three Springs ..... *V . luteola* A.S. George

74b Sepals 3-4.6 mm long; petals usually 3-4 mm long

80a Leaves with prominent
cilia to 1 mm long..... *V. blepharophylla* A.S. George

80b Leaves erose to closely ciliate with cilia
less than 0.5 mm long

81a Style 6-9 mm long, straight; peduncles to 0.2 mm
long; flowers closely packed; leaves appressed,
imbricate; bracteoles sometimes persistent ..... *V. spicata* F. Muell.

81b Style 3-6 mm long, curved below apex;
peduncles 0.5-3 mm long; flowers rather
loosely packed; leaves spreading to appressed,
usually not imbricate; bracteoles caducous

82a Petals markedly narrowed upwards;
Busselton-Bunbury district ..... *V. attenuata* A.S. George

82b Petals not or slightly narrowed

83a Sepals with prominent basal auricles
almost covering hypanthium;
Pindar-Koorda district ..... *V. auriculata* A.S. George

83b Sepals with small auricles or few
or no reflexed basal cilia

84a Petals oblong, the fringe 2.5-3 mm long
(longer than lamina); style 5-6 mm long;
leaves 1-2 mm long, spreading, grey-green;
Southern Cross district..... *V. mitodes* A.S. George

84b Petals ovate, the fringe 1-1.5 mm long
(less than half lamina); style c. 4 mm long;
leaves dark or bright green, appressed,
1.5-2.5 mm long; Kalbarri to Eneabba

85a Peduncles 2-2.5 mm long; petals 3.5 mm long,
the fringe 1 mm long; leaves densely ciliate;
flowers pale to deep pink..... *V. centipeda* A.S. George

85b Peduncles 1 mm long; petals 4 mm long,
the fringe 1.5 mm long; leaves erose to
shortly and openly ciliate; flowers cream
to pale pink ..... *V. pholidophylla* F. Muell.

66b Sepals with plumose lobes and with peltate basal auricles
covering hypanthium; petals with small basal auricles;
leaves orbicular, usually entire; bracteoles persistent ..... sect. *Pennuligera* Meissner

86a Staminodes channelled and slightly flared towards apex, or oblong, dentate

87a Flowers pale pink; sepal lobes broad, plumose; petals 4-4.5 mm long; staminodes oblong, 3-3.5 mm long; Eneabba ..... *V. fragrans* A.S. George

87b Flowers pale yellow; sepal lobes either narrow and fimbriate or obscurely lobed; petals 2.5-4 mm long; staminodes channelled, flared, 1.5-2.5 mm long

88a Petals entire to shortly dentate; style 5.5-6.5 mm long, the beard hairs 0.2-0.6 mm long, surrounding style for several mm; Kalbarri to Wicherina ..... *V. lepidophylla* F. Muell.

88b Petals fimbriate; style 4.5-5.5 mm long, the beard unilateral and tufted, with hairs to 0.8 mm long; Three Springs to Morawa ..... *V. comosa* A.S. George

86b Staminodes linear-subulate, entire but usually with prominent oil glands

89a Style 20-25 mm long; petals dentate Burma Road to Badgingarra ..... *V. grandis* Drummond

89b Style less than 20 mm long; petals fimbriate or digitate;

90a Style 10-19 mm long; flowers silver and purple, or red; Kalbarri to Yuna area

91a Petals digitately lobed, purple; sepals purple with silver lobes ..... *V. oculata* Meissner

91b Petals fimbriate, creamish red to bright red; sepals bright red ..... *V. etheliana* C. Gardner

90b Style 5-8 mm long; flowers pink, white, maroon or yellow

92a Sepals 8-9 mm long; style 8 mm long ..... *V. serotina* A.S. George

92b Sepals 4-6 mm long; style 5-7 mm long

93a Style hairs 0.2-0.3 mm long

94a Peduncles 2.5-4 mm long; flowers golden or pale yellow ..... *V. chrysostachys* Meissner

94b Peduncles 1-2 mm long; flowers cream to silvery pink or pink-maroon

95a Leaves 3-4 mm long; flowers pink-maroon; sepal lobes 8-13; style curved below apex ..... *V. venusta* A.S. George

95b Leaves 4-7 mm long; flowers cream to silvery pink; sepal lobes 7-9; style straight ..... *V. argentea* A.S. George

93b Style hairs 0.7-1.2 mm long

96a Leaves 3.5-9 mm wide; sepal lobes 7-9; flowers deep pink to maroon ..... *V. muelleriana* E. Pritzel

96b Leaves 2-4.5 mm wide; sepal lobes 10-13; flowers white, pink, or maroon and yellow

97a Sepal lobe midrib 0.2-0.3 mm wide; petals 5-7 mm long, the fringe 2-2.5 mm long; flowers pink or maroon and yellow; Kalbarri and north-western areas

98a Flowers maroon and yellow; leaf margin entire; petal fimbriae obtuse; staminodes shorter than stamens; Kalbarri area ..... *V. dichroma* A.S. George

98b Flowers pink; leaf margin erose; petal fimbriae acute; stamens equalling or exceeding stamens; Carnarvon-Onslow-Kennedy Range area ..... *V. forrestii* F. Muell.

97b Sepal lobe midrib 0.1-0.2 mm wide; petals 4-5 mm long, the fringe 1 mm long; flowers white with pink centre; SW of Three Springs ..... *V. albida* A.S. George

Infrageneric classification

A revised infrageneric classification is presented here. It is based on overall morphology, important characters being the leaves, hypanthium, sepals, petals, anthers, style and ovules. Two ranks are recognised - subgenus and section.

Few infrageneric taxa have been described previously. Only Bentham (1867) provided a detailed system but used formal names for two sections leaving the subsidiary groups informal.

Schauer (1840) recognised three subgenera on the basis of calyx and anther characters. The name of one of his subgenera, *Catocalypta*, has been widely misapplied since Bentham. Meissner (1857) divided the genus into four sections based on characters of the calyx. Bentham's treatment in "Flora Australiensis" recognised two sections using anther and ovule characters. Within each section he grouped species on characters of the calyx, supplemented in some cases by the petals, anther connective, floral arrangement and leaves.

Baillon (1877) ignored previous classifications and simply divided the genus into two sections - *Euverticordia* with no appendages to the calyx, and *Calymmatantha* (as *Calymmatanthus*), with comose calyx appendages. For the latter taxon he referred to Schauer's t. 4B (1840), where the only species figured with comose sepal appendages is *V. insignis*, the lectotype of sect. *Catocalypta*. The same species is thus the type of sect. *Calymmatantha*, making it a superfluous name.

Gardner (1930-31) followed Bentham's division into two sections, with the same sectional names as that author.

The following synopsis of the infrageneric taxa is in systematic order, with a tabulated summary at the end. The system is based on an assessment of the morphology and begins with the least complex floral form as seen in sect. *Chrysoma*, passing to the most complex in sect. *Pennuligera*. While the relationship between some taxa at each rank is clear, it is less evident in others. Sections *Infuscata* and *Elachoschista* are evidently related to each other but their relationship to other sections is uncertain. Further study should clarify the systematic arrangement in the genus.

Verticordia subg. **Chrysoma** Schauer, Monogr. Myrtac. Xerocarp. 220 (1840). *Lectotype* (here chosen): *V. acerosa* Lindley

Typification. Schauer included five species with his protologue, namely *V. acerosa* Lindley, *V. serrata* (Lindley)Schauer, *V. nitens* (Lindley) Endl., *V. chrysantha* Schauer and *V. grandiflora* Endl. The diagnosis favours no species over another. Schauer misinterpreted the style as included in *V. acerosa*, *V. serrata*, *V. nitens* and *V. chrysantha*, possibly through examining unopened flowers. *V. acerosa* is therefore chosen arbitrarily as the lectotype.

Bracteoles not apiculate. Hypanthium without appendages, glabrous. Flowers yellow, sometimes ageing red, in one species orange. Anthers saccate, opening by two pores towards apex, with an apical appendage. Style glabrous. Ovules 1 or 2.

A subgenus of seven sections containing 21 species.

Verticordia sect. **Chrysoma** (Schauer) A.S. George, stat. nov.- *Verticordia* subg. *Chrysoma* Schauer, Monogr. Myrtac. Xerocarp. 220 (1840). *Type*: *V. acerosa* Lindley

Lower leaves linear, semiterete; upper leaves ovate, orbicular or lanceolate. Flowers in corymb-like groups, bright yellow, usually ageing reddish. Bracteoles caducous. Hypanthium turbinate, 10-ribbed, usually colliculate or verrucose. Sepal lobes openly to densely fimbriate. Petals digitately lobed. Stamens spreading to erect, often later incurved; anthers with small entire appendage; staminodes oblong, lanceolate, cuneate or subulate, entire, dentate or fimbriate. Style included to exserted.

A section of four species - *V. acerosa, V. citrella, V. endlicheriana* and *V. subulata.*

Verticordia sect. **Jugata** A.S. George, sect. nov.

Folia infera linearia, semiteretia, supera linearia, oblonga vel anguste lanceolata, semiteretia vel concava. Flores turmis corymbiformibus, flavi, plerumque rubescentes. Bracteolae unitae, persistentes. Hypanthium ± hemisphericum, 10-costatum, verrucosum. Sepalorum lobi dense fimbriati. Petala digitaliter lobata. Stamina erecta; antherae appendice concava saepe emarginata; staminodia oblonga, lanceolata vel triangularia, integra, dentata vel fimbriata. Stylus plerumque breviter exsertus.

Typus: *V. chrysantha* Endl.

Lower leaves linear, semiterete, the upper ones linear, oblong or narrowly lanceolate, semiterete or concave. Flowers in corymb-like groups, yellow, usually turning red. Bracteoles united, persistent. Hyanthium ± hemispherical, 10-ribbed, warty. Lobes of sepals densely fimbriate. Petals digitately lobed. Stamens erect; anthers with a concave often lobed appendage; staminodes oblong, lanceolate or triangular, entire dentate or fimbriate. Style usually shortly exserted.

A section of seven species - *V. amphigia, V. brevifolia, V. chrysantha, V. chrysanthella, V. coronata, V. galeata* and *V. laciniata*. It is characterised especially by the united persistent bracteoles and the emarginate or entire anther appendage. *V. laciniata* is unusual in the section in having ciliate leaves.

Etymology. The sectional name is from the Latin *jugatus* (yoked together), in reference to the united bracteoles that persist like a collar around the hypanthium.

Verticordia sect. **Unguiculata** A.S. George, sect. nov.

Folia infera linearia, semiteretia, supera linearia vel oblonga, semiteretia. Flores turmis corymbiformibus, flavi, rubescentes. Bracteolae unitae, persistentes. Hypanthium late hemisphericum, obscure 10-costatum, verrucosum. Sepalorum lobi dense fimbriati. Petala digitaliter lobata. Stamina erecta vel inflexa; antherae appendice prominenti bifurcata; staminodia lanceolata ad triangularia, lobata vel fimbriata. Stylus exsertus vel inclusus.

Typus: V. grandiflora Endl.

Lower leaves linear, semiterete, the upper ones linear or oblong, semiterete. Flowers in corymb-like groups, yellow, turning red. Bracteoles united, persistent. Hypanthium broadly hemispherical, obscurely 10-ribbed, warty. Lobes of sepals densely fimbriate. Petals digitately lobed. Stamens erect or inflexed; anthers with a prominently bifurcate appendage; staminodes lanceolate or triangular, lobed or fimbriate. Style exserted or included.

A section of three species - *V. grandiflora*, *V. nobilis* and *V. rutilastra*. The united persistent bracteoles and especially the bifid anther appendage are diagnostic.

Etymology. Named from the Latin *unguiculatus* (clawed), in reference to the anther appendage which resembles two claws.

Verticordia sect. **Sigalantha** A.S. George, sect. nov.

Folia infera linearia, semiteretia, supera ovata, linearia, oblonga vel elliptica, concava vel semiteretia, saepe ciliata. Flores turmis corymbiformibus, flavi, pallescentes vel cinerascentes. Bracteolae caducae. Hypanthium depresso-hemisphericum, obscure 10-costatum, glabrum. Sepalorum lobi fimbriati. Petala dentata vel integra, nitentia. Stamina erecta; antherae appendice prominenti, integra, plicata; staminodia oblonga, integra. Stylus exsertus.

Typus: V. serrata (Lindley) Schauer

Lower leaves linear, semiterete, the upper ones ovate, linear, oblong or elliptic, concave or semiterete, often ciliate. Flowers in corymb-like groups, yellow, becoming pale or grey. Bracteoles caducous. Hypanthium depressed-hemispherical. Petals dentate or entire, shining. Stamens erect; anthers with a prominent entire plicate appendage; staminodes oblong, entire. Style exserted.

A section of two species - *V. integra* and *V. serrata*. Diagnostic characters are the depressed-hemispherical hypanthium, large entire or dentate petals and entire staminodes, and large anther appendage.

Etymology. Named from the Greek *sigaloeis* (glossy, shiny) and *anthos* (a flower), in reference to the bright flowers, especially the glossy petals.

Verticordia sect. **Chrysorhoe** (Lindley) A.S. George, stat. nov. - *Chrysorhoe* Lindley, Comp. Bot. Mag. 2: 357 (1837). Type: *C. nitens* Lindley = *Verticordia nitens* (Lindley) Endl.

Leaves all linear, semiterete. Flowers in corymb-like groups, orange, gold or yellow. Bracteoles caducous.Hypanthium broadly turbinate, 10-ribbed, obscurely warty. Sepal lobes fimbriate. Petals orbicular, erose to dentate, shining. Stamens and staminodes erect; anther appendage inflated, with laterally compressed apex; staminodes narrowly triangular, entire. Style exserted, slender.

A section of three species - *V. aurea, V. nitens* and *V. patens*. Diagnostic characters are the semiterete leaves, broadly turbinate hypanthium, prominent erose to dentate petals, large anther appendage with compressed apex, and narrow staminodes.

Verticordia sect. **Cooloomia** A.S. George, sect. nov.

Folia infera linearia, semiteretia, mediana lanceolata, supera orbicularia. Flores turmis corymbiformibus, flavis, ?pallescentes. Bracteolae caducae. Hypanthium late turbinatum, crasse costatum. Sepalorum lobi breviter fimbriati. Petala prominentia, erosa. Stamina erecta; antherae appendice antice amplectenti fimbriata; staminodia linearia, integra. Stylus exsertus.

Typus: V. cooloomia A.S.George

Lower leaves linear, semiterete, the mid-ones lanceolate, the upper orbicular. Flowers in corymb-like groups, yellow ?becoming pale. Bracteoles caducous. Hypanthium broadly turbinate, thickly ribbed. Lobes of sepals shortly fimbriate. Petals prominent, erose. Stamens erect; anther appendage clasping in front, fimbrate; staminodes linear, entire. Style exserted.

A monotypic section. Related to sect. *Chrysorhoe* but clearly distinct in the three leaf forms, shortly fimbriate sepal lobes and very large fimbriate anther appendage.

Etymology. Named from the type species of the section.

Verticordia sect. **Synandra** A.S. George, sect. nov.

Folia linearia, teretia, conferta. Flores dissiti, nutantes vel patentes, lutei, rubescentes. Bracteolae non cuspidatae, unitae, persistentes. Hypanthium turbinatum, 10-costatum, verrucosum. Sepalorum lobi fimbriati. Petala digitaliter lobata. Stamina staminodiaque in tubo unita, erecta; antherae appendice parva; staminodia subulata. Stylus non vel parce exsertus.

Typus: V. staminosa C. Gardner & A.S. George

Leaves linear, terete, crowded. Flowers scattered, nodding or spreading, yellow, turning red. Bracteoles united, not cuspidate, persistent. Hypanthium turbinate, 10-ribbed, warty. Lobes of sepals fimbriate. Petals digitately lobed. Stamens and staminodes united in a tube, erect; anthers with small appendage; staminodes subulate. Style not or scarcely exserted.

A monotypic section. The branchlets and peduncles are densely hispid. The section is clearly distinguished in subg. *Chrysoma* by the prominent androecial tube.

Etymology. Named from the Greek *syn-* (together) and *-andros* (male), in reference to the united stamens and staminodes.

Verticordia DC. subg. **Verticordia**.

Bracteoles with or without apiculum. Hypanthium without appendages, often hairy. Flowers pink, red, cream, white, purplish or yellow. Anthers ± globular, turned adaxially, in some taxa erect, opening by pores on the upper side, the pores often slit-like before dehiscence; appendage none or a small swelling. Style variously hairy, or glabrous in a few taxa. Ovules 1-5.

A subgenus of eleven sections containing 35 species.

Verticordia DC. sect. **Verticordia**. - *V.* subg. *Euverticordia* Schauer, Monogr. Myrtac. Xerocarp. 199 (1840), as *Euverdicordia*, nom. illeg. - *V.* sect. *Euverticordia* F. Muell., Trans. Proc. Victorian Inst. Adv. Sci. 1: 122 (1855), nom. illeg.

Leaves linear or clavate, semiterete. Flowers scattered or in corymb-like groups, pink or yellow. Bracteoles cuspidate, often connate, caducous or sometimes persistent. Hypanthium turbinate, hairy. Sepals with plumose lobes. Petals ovate, fimbriate to entire, usually pubescent outside. Stamens and staminodes incurved; anthers inflexed, opening by somewhat oblique pores; staminodes linear, with prominent oil glands, glabrous or fimbriate. Style usually exserted, often curved below apex, bearded.

A section of eight species - *V. crebra*, *V. fimbrilepis*, *V. harveyi*, *V. helichrysantha*, *V. pityrhops*, *V. plumosa*, *V. sieberi* and *V. stenopetala*.

Verticordia sect. **Corymbiformis** A.S.George, sect. nov.

Folia lincaria, lanceolata vel oblonga, semiteretia vel concava. Flores turmis corymbiformibus, plerumque fruticem totum tegentes, cremei, rosei vel luteoli. Bracteolae non cuspidatae, caducae. Hypanthium depresso-hemisphericum vel turbinatum, in medium saepe constrictum, pilosum. Sepalorum lobi profunde laciniati. Petala ovata ad orbicularia, fimbriata, extus pubescentia vel glabra. Stamina staminodiaque patentia; antherae poris proximis dehiscentes; staminodia linearia, glandulosa. Stylus exsertus, barbatus vel glaber.

Typus: V. brownii (Desf.) DC.

Leaves linear, lanceolate or oblong, semitercte or concave. Flowers in corymb-like groups, usually quite covering the shrub, cream, pink or pale yellow. Bracteoles not cuspidate, caducous. Hypanthium depressed-hemispherical or turbinate, often constricted in middle, pilose. Lobes of sepals deeply laciniate. Petals ovate to orbicular, fimbriate, pubescent outside or glabrous. Stamens and staminodes spreading; anthers dehiscing by close pores; staminodes linear, glandular-warty. Style exserted, bearded or glabrous.

A section of five species - *V. brownii*, *V. capillaris*, *V. densiflora*, *V. eriocephala* and *V. polytricha*. It is closely related to sect. *Verticordia*, differing mainly in the fimbriate to laciniate sepal divisions, and on the other hand to sect. *Micrantha*. Three species (*V. brownii*, *V. eriocephala* and *V. capillaris*) have the hypanthium constricted about the middle.

Etymology. The section is named from the Latin *corymbus* (a corymb) and *-formis* (formed, shaped), in reference to the floral arrangement characteristic of most taxa.

Verticordia sect. **Micrantha** A.S. George, sect. nov.

Folia linearia, semiteretia-triquetra. Flores dissiti vel turmis parvis corymbiformibus, albidi, rosei, rubri vel flavi. Bracteolae non cuspidatae, caducae vel persistentes. Hypanthium anguste turbinatum, 5-costatum, pilosum. Sepala profunde laciniata. Petala anguste ovate, integra, glabra vel pubescentia. Stamina staminodiaque patentia; antherae poris proximis dehiscentes; staminodia subulata, parva. Stylus exsertus, barbatus.

Typus: V. minutiflora F. Muell.

Leaves linear, semiterete to triquetrous. Flowers scattered or in small corymb-like groups, whitish, pink, red or yellow. Bracteoles not cuspidate, caducous or persistent. Hypanthium narrowly turbinate, 5-ribbed, pilose. Sepals deeply laciniate. Petals narrowly ovate, entire, glabrous or pubescent. Stamens and staminodes spreading; anthers opening by close pores; staminodes subulate, small. Style exserted, bearded.

A section of three species - *V. fastigiata, V. minutiflora* and V. *vicinella.* It differs from sect. *Corymbiformis* and sect. *Verticordia* especially in the very small flowers and 5-ribbed hypanthium.

Etymology. Named from the Greek *micro-* (small) and *anthos* (flower), in reference to the flowers which include the smallest in the genus.

Verticordia sect. **Infuscata** A.S. George, sect. nov.

Folia linearia, semiteretia, conferta. Flores dissiti, cremei et purpurei vel cremei et rosei, sed ± fusci. Bracteolae non cuspidatae, caducae. Hypanthium hemisphericum, non costatum sed ad apicem cum tumoribus 5, ad basin comosum. Sepala profunde laciniata fimbriis rigescentibus scabridis. Petala patentia mox incurva, integra vel ciliata, marginibus translucidis. Stamina staminodiaque ± libera, recta ad inflexa; antherae inflexae; staminodia linearia, glandulosa. Stylus longe exsertus, breviter barbatus. Ovuli 2.

Typus: V. oxylepis Turcz.

Leaves linear, semiterete, crowded. Flowers scattered, cream and purple or cream and pink, but ± dark. Bracteoles not cuspidate, caducous. Hypanthium hemispherical, not ribbed but with 5 swellings towards apex, comose at base. Sepals deeply laciniate with rather stiff scabrid fimbriae. Petals spreading but soon incurved, entire or ciliate, with translucent margins. Stamens and staminodes ± free, straight to inflexed; anthers inflexed; staminodes linear, glandular. Style long-exserted, shortly bearded. Ovules 2.

A section of two species - *V. longistylis* and *V. oxylepis*. Both are small shrubs with dark foliage and relatively dull, inconspicuous flowers. The hemispherical, basally comose hypanthium, stiffly laciniate sepals, petals with translucent margins and long, shortly bearded style are diagnostic.

Etymology. Named from the Latin *infuscatus* (darkened, dull), in reference to the appearance of the plants.

Verticordia sect. **Elachoschista** A.S. George, sect. nov.

Folia linearia, semiteretia, conferta. Flores moderate conferti, cremei demum virido-brunnei. Bracteolae non cuspidatae, caducae. Hypanthium hemisphaericum, non costatum, in dimidio inferiore comosum. Sepala brevissime lacerata ad erosa. Petala erecta, integra vel obscure ciliata. Stamina staminodiaque unita; antherae ± obovoideae, poris supra connectivo parvo aperientes; staminodia linearia, ad apicem ± glandulosa. Stylus longe exsertus, parce barbatus. Ovuli 2.

Typus: V. verticordina (F. Muell.) A.S. George

Leaves linear, semiterete, crowded. Flowers moderately crowded, cream, later greenish-brown. Bracteoles not cuspidate, caducous. Hypanthium hemispherical, not ribbed, comose in lower half. Sepals very shortly lacerate to erose. Petals erect, entire or obscurely ciliate. Stamens and staminodes united; anthers ± obovoid, opening by small pores above connective; staminodes linear, glandular towards apex. Style long-exserted, sparsely bearded. Ovules 2.

A section of one species - *V. verticordina*. In habit and general morphology it resembles sect. *Infuscata*, but the unlobed, almost entire sepals give the flowers a distinctive aspect. The prominent staminodes, exceeding the stamens, are also unusual in the genus.

Etymology. Named from the Greek *elachys* (little, short) and *schistos* (divided, cleft), in reference to the almost entire sepals.

Verticordia sect. **Penicillaris** A.S. George, sect. nov.

Folia linearia-oblonga, semiteretia, marginibus ciliatis-erosis. Flores turmis parvis, cremei vel luteoli. Bracteolae cuspidatae, caducae. Hypanthium hemisphericum, non costatum, ad basin comosum. Sepala profunde et divaricater divisa fimbriis filiformibus, cum vel sine auriculis basalibus laciniatis. Petala ± translucentia, patentia, fimbriata, aliter glabra. Stamina staminodiaque breviter unita, patentia-erecta; antherae inflexae; staminodia subulata. Stylus exsertus, prominenter pilosus.

Typus: V. penicillaris F.Muell.

Leaves linear-oblong, semiterete, with ciliate-erose margins. Flowers in small groups, cream or pale yellow. Bracteoles cuspidate, caducous. Hypanthium hemispherical, not ribbed, comose at base. Sepals deeply and divaricately divided into filiform fimbriae, with or without laciniate basal auricles. Petals ± translucent, spreading, fimbriate, otherwise glabrous. Stamens and staminodes shortly united, spreading to erect; anthers inflexed; staminodes subulate. Style exserted, prominently pilose.

A section of two species - *V. dasystylis* and *V. penicillaris*, characterised especially by the long very hairy style, translucent petals, short ciliate-erose leaves and shortly united androecium.

Etymology. Named from the type species of the section.

Verticordia sect. **Pilocosta** A.S. George, sect. nov.

Folia linearia, semiteretia, integra. Flores turmis rotundatis vel ± dissiti, cremei, flavi vel rosei, saepe rubescentes. Hypanthium turbinatum, 10-costatum, ad basin comosum, costis hirsutis. Sepala fimbriata, sine auriculis. Petala ± orbicularia, fimbriata. Stamina staminodiaque breviter unita; antherae globosae poris distinctis dehiscentes. Stylus crassus, pilosus; stigma capitata.

Typus: V. huegelii Endl.

Leaves linear, semiterete, entire. Flowers in rounded groups or ± scattered, cream, yellow or pink, often turning red. Hypanthium turbinate, 10-ribbed, comose towards base, the ribs hirsute. Sepals fimbriate, without auricles. Petals ± orbicular, fimbriate. Stamens and staminodes shortly united; anthers globose, dehiscing by distinct pores. Style thick, pilose; stigma capitate.

A section of 3 species - *V. huegelii, V. brachypoda* and *V. multiflora.* Diagnostic characters are the turbinate hypanthium with 10 hirsute ribs, fimbriate sepals without auricles, hirsute style and capitate stigma.

Etymology. Sectional epithet from the Latin *pilus* (hair) and *costa* (rib), in reference to the ribs of the hypanthium.

Verticordia sect. **Catocalypta** (Schauer) Meissner, in W.J. Hooker, J. Bot. Kew Gard. Misc. 8: 19 (1856). - *V.* subg. *Catocalypta* Schauer, Monogr. Myrtac. Xerocarp. 213 (1840). *Lectotype* (here chosen): *V. insignis* Endl.

V. sect. *Calymmatantha* Baillon, Hist. Pl. 6: 368 (1877), as *Calymmatanthus*, nom. superfl. *Type: V. insignis* Endl.

Leaves oblong to linear, triquetrous, entire. Flowers in rounded or corymb-like groups, white or pink. Bracteoles not cuspidate, caducous. Hypanthium turbinate, 10-ribbed. Sepals lobes deeply fimbriate, and with basal auricles reflexed against hypanthium and densely fimbriate upturned apices. Petals spreading, fimbriate or entire. Stamens and staminodes erect to inflexed; anthers ± globular to rounded-trapezoid, sometimes with a swelling between the pores; staminodes broad, fimbriate, sometimes linear and entire or 1-2-lobed. Style included to exserted, glabrous.

A section of six species - *V. habrantha, V. inclusa, V. insignis, V. lehmannii, V. pritzelii* and *V. roei.*

Schauer included four species with the protologue of subg. *Catocalypta*, namely *V. huegelii, V. compta* (now = *V. insignis* subsp. *compta*), *V. insignis* and *V. roei.* In the diagnosis, he emphasised the reflexed auricles of the sepals that have divided apices upturned and forming a dense tuft ('involucrum') about the hypanthium. In fact *V. huegelii* does not have this character but instead has a tuft of hairs at the base of the hypanthium and no auricles to the sepals. This species is here placed in sect. *Pilocosta.* Schauer illustrated *V. insignis*, again highlighting the sepal auricles both in a figure and in the caption. This species is here selected as lectotype.

In addition to this feature, other diagnostic characters of the section are the triquetrous leaves, large fimbriate or entire petals, usually fimbriate staminodes and glabrous style. *V. pritzelii* is somewhat anomalous in the section in its longer leaves but appears closely related to *V. lehmannii*.

The name *Catocalypta* was correctly used by Turczaninow (1847) and Meissner (1857), but has been widely misapplied since Bentham (1867) excluded from it all taxa included by Schauer. Bentham misunderstood the anther form in particular, using the name for species having ovoid or oblong anthers opening by slits. Authors who have followed Bentham include Mueller (1878), Engler & Prantl (1892), Diels & Pritzel (1904), Gardner (1930-31) and Rye (1979).

Verticordia sect. **Platandra** A.S. George, sect. nov.

Folia linearia-elliptica, triquetra, integra. Flores turmis parvis subcorymbiformibus, rosei. Hypanthium late turbinatum, 10-costatum, ad basin comosum, costis pilosis. Sepala profunde divisa segmentis filiformibus scabridis, sine auriculis. Petala ± orbicularia, erosa, papillosa, extus ad basin pilosa. Stamina staminodiaque erecta; antherae inflexae, depresso-sphericae poris proximis; staminodia linearia-teretia, glandulosa. Stylus parce excentricus, breviter exsertus, ad apicem curvatus barbatus pilis furcatis.

Typus: V. gracilis A.S. George

Leaves linear to elliptic, triquetrous, entire. Flowers in small subcorymb-like groups, pink. Hypanthium broadly turbinate, 10-ribbed, comose towards base, with pilose ribs. Sepals deeply divided into filiform, scabrid segments, without auricles. Petals ± orbicular, erose, papillose, pilose outside towards base. Stamens and staminodes erect; anthers inflexed, depressed-hemispherical with very close pores; staminodes linear-terete, glandular. Style slightly excentric, shortly exserted, towards the apex curved and bearded with forked hairs.

A monotypic section. The species resembles *V. pritzelii* but differs especially in the non-auriculate sepals, flattened anthers and style beard of forked hairs. In the last character it shows a link with subg. *Eperephes*.

Etymology. Named from the Greek *platy-* (flattened) and *-andros* (male), in reference to the compressed anthers.

Verticordia sect. **Recondita** A.S. George, sect. nov.

Folia omnia linearia, triquetra. Flores dissiti, nutantes, rubri. Bracteolae non cuspidatae, ad anthesin persistentes, postea deciduae. Hypanthium turbinatum sed ad basin constrictum, pilosum. Sepala profunde divisa segmentis scabridis, sine auriculis. Petala ciliata, extus pubescentia. Stamina incurva antheris recurvis; staminodia subulata. Stylus exsertus, barba parva. Ovulum 1.

Typus: V. humilis Benth.

Leaves all linear, triquetrous. Flowers ± scattered, nodding, red. Bracteoles not cuspidate, persistent until anthesis, then falling. Hypanthium turbinate but constricted towards base, pilose. Sepals deeply divided into scabrid segments, without auricles. Petals ciliate, pubescent outside. Stamens incurved with recurved anthers; staminodes subulate. Style exserted, with a small beard. Ovule 1.

A monotypic section. *V. humilis* appears related to such taxa as *V. gracilis* and *V. pulchella* but at a sectional level does not rest easily with either.

Etymology. Named from the Latin *reconditus* (hidden, not easily seen), in reference to the small stature, pendulous sparse flowers and closed petals covering the androecium.

Verticordia sect. **Intricata** A.S. George, sect. nov.

Folia linearia, triquetra vel semiteretia. Flores turmis laxis vel corymbiformibus, rubri vel rosei. Bracteolae non cuspidatae, caducae. Hypanthium turbinatum , 10-costatum, ad apicem expansum tumoribus 5, comosum. Sepalorum lobi primarii divaricater et subtiliter divisi, etiam auriculis reflexis divaricater divisis. Petala fimbriata. Stamina staminodiaque unita, erecta; antherae ± erectae, globoso-trapezoidiformes, poris elongatis divergentibus dehiscentes, cum tumore interjacenti; staminodia subulata. Stylus exsertus vel inclusus, glaber vel parce barbatus. Ovuli 2.

Typus: V. monadelpha Turcz.

Leaves linear, triquetrous or semiterete. Flowers in loose or corymb-like groups, red or pink. Bracteoles not cuspidate, caducous. Hypanthium turbinate, 10-ribbed, expanded towards apex with 5 swellings, comose. Lobes of sepals divaricately and finely divided, also with reflexed, divaricately divided auricles. Petals fimbriate. Stamens and staminodes united, ± erect; anthers erect, globose-trapeziform, dehiscing by elongated divergent pores with a swelling between; staminodes subulate. Style exserted or included, glabrous or sparsely bearded. Ovules 2.

A section of 3 species - *V. mitchelliana, V. monadelpha* and *V. pulchella.* It is characterised especially by the divaricately-divided sepals with similar reflexed auricles, the fimbriate petals and erect androecium with small erect anthers and subulate staminodes.

Etymology. Named from the Latin *intricatus* (intricate), in reference to the sepals.

Verticordia subg. **Eperephes** A.S. George, subg. nov.

Bracteolae plerumque apiculatae. Hypanthium cum appendiculis 5 apicalibus reflexis crassis viridibus, in taxis aliquot breviter limbatum vel appendiculis nullis, glabrum. Flores rosei, rufi, cremei, lutei vel albidi. Antherae abaxialiter obversae, ab rimis ± parallelis dehiscentes, filamenti apice tumido. Stylus ad apicem barbatus pilis plerumque furcatis, in taxis aliquot simplicibus. Ovuli 6-13, in placenta peltata basali.

Typus: V. pennigera Endl.

Bracteoles usually apiculate. Hypanthium with 5 apical reflexed thick green appendages, or in several taxa shortly lobed or without appendages, glabrous. Flowers pink, red, cream, yellow or white. Anthers facing abaxially, dehiscing by ± parallel slits, the filament swollen at apex. Style bearded towards apex with usually forked hairs, or in some taxa simple hairs. Ovules 6-13, on a peltate basal placenta.

A subgenus of six sections containing 41 species. The name sect. *Catocalypta* Schauer has often been applied to this taxon but that name is correctly used for a section of subg. *Verticordia* (see above). The subgenus is distinguished from the remainder of the genus especially by the anthers with ± parallel slits and the higher number of ovules. The species included in sect. *Integripetala* and sect. *Tropica* show other characters similar to some species of subg. *Verticordia*, and a generic split is not appropriate.

Etymology. The subgenus is named from the Greek *eperephes* (overhanging, beetling), in reference to the 5 reflexed appendages of the hypanthium of many species.

Verticordia sect. **Integripetala** A.S. George, sect. nov.

Folia linearia vel clavata, semiteretia, glabra. Flores turmis corymbiformibus in ramulis lateralibus, rosei vel cremei. Hypanthium hemisphericum, 10-costatum, appendiculis parvis globularibus inter costas infra medium. Sepalorum lobi fimbriati. Petala integra. Stamina staminodiaque ad basin unita; antherae oblique introrsae vel horizontales; staminodia erecta vel recurva, ± teretia. Stylus breviter barbatus pilis reflexis. Ovuli 9-13.

Typus: V. picta Endl.

Leaves linear or clavate, semiterete, glabrous. Flowers in corymb-like groups on lateral branchlets, pink or cream. Hypanthium hemispherical, 10-ribbed, with small globular appendages between the ribs below the middle. Lobes of sepals fimbriate. Petals ± entire. Stamens and staminodes united towards base; anthers obliquely introrse or horizontal; staminodes erect or recurved, ± terete. Style shortly bearded with reflexed hairs. Ovules 9-13.

A section of four species - *V. helmsii, V. interioris, V. picta* and *V. rennieana*. In some characters it resembles subg. *Verticordia* - the semiterete leaves, fimbriate sepal lobes and the introrse anthers.

Etymology. Named from the Latin *integer* (whole, entire) and *petalum* (petal); the four species of the section have the petals entire or almost so.

Verticordia sect. **Tropica** A.S. George, sect. nov.

Frutices elati vel arbores parvae. Folia linearia, triquetra vel semiteretia. Flores turmis parvis subterminalibus, cremei. Bracteolae caducae. Hypanthium hemisphericum, 5-costatum, sine appendiculis. Sepala lobis ± irregularibus fimbriatis divisa, breviter auriculata. Petala ovata, breviter fimbriata. Stamina staminodiaque unita, erecta; antherae ± horizontales; staminodia linearia, glandulosa. Stylus exsertus, rectus, barba parva pilis simplicibus. Ovuli 8-10.

Typus: V. cunninghamii Schauer

Tall shrubs or small trees. Leaves linear, triquetrous or semiterete. Flowers in small subterminal groups, cream. Bracteoles caducous. Hypanthium hemispherical, 5-ribbed, without appendages. Sepals divided into ± irregular fimbriate lobes, shortly auriculate. Petals ovate, shortly fimbriate. Stamens and staminodes united, erect; anthers ± horizontal; staminodes linear, glandular. Style exserted, straight, the beard small with simple hairs. Ovules 8-10.

A series of 3 species - *V. cunninghamii, V. decussata* and *V. verticillata,* in tropical W.A. and N.T. It contains the only tropical species in the genus. Diagnostic characters are the linear entire leaves, hypanthium without appendages, irregularly divided sepals with small auricles, fimbriate petals and style with a short beard of simple hairs immediately below the stigma.

Etymology. The sectional epithet, from the Latin *tropicus*, refers to the geographical distribution of the included species.

Verticordia sect. **Jamiesoniana** A.S. George, sect. nov.

Folia oblonga, semiteretia, marginibus ± translucentibus irregularibus. Flores turmis parvis subterminalibus. Bracteolae cuspidatae. Hypanthium late turbinatum, nitens, 10-costatum, sine appendiculis. Sepalorum lobi fimbriati, sine auriculis vel lobis reflexis. Petala parce erosa vel breviter fimbriata. Stamina staminodiaque unita, pilosa; antherae rimis prominentibus dehiscentes. Stylus rectus, ad basin crassus hirsutus. Ovuli 8 vel 9.

Typus: V. jamiesonii F. Muell.

Leaves oblong, semiterete, with ± translucent irregular margins. Flowers in small subterminal groups. Bracteoles cuspidate. Hypanthium broadly turbinate, shining, 10-ribbed, without appendages. Sepals with fimbriate lobes, without auricles or reflexed lobes. Petals slightly erose or shortly fimbriate. Stamens and staminodes united, pilose; anthers dehiscing by prominent slits. Style straight, thick and hirsute towards base. Ovules 8 or 9.

A monotypic section, in the central west of semi-arid Western Australia.

The combination of characters described above distinguishes *V. jamiesonii* from other sections of subg. *Eperephes*, in particular the turbinate hypanthium without appendages, the pilose stamens and staminodes and the style with thick hirsute base. The leaves easily distinguish it from sect. *Integripetala.*

Etymology. Named for the type species of the section.

Verticordia sect. **Verticordella** Meissner, J. Proc. Linn. Soc., Bot., 1: 44 (1857). *Type: V. drummondii* Schauer

Leaves ovate, oblong, linear or orbicular, ciliate or erose, concave or semiterete. Flowers in raceme- or spike-like groups, pink, occasionally red or pale yellow. Bracteoles cuspidate, caducous.

Hypanthium turbinate, often 5-ribbed, with reflexed green appendages. Sepals with fimbriate lobes, with sessile auricles or reflexed cilia. Petals spreading to erect, incurved with age, fimbriate to dentate, rarely erose. Stamens and staminodes very shortly united, erect to incurved, the anthers extrorse; staminodes subulate or terete, with raised oil glands. Style excentric, sometimes central, curved and bearded with forked hairs below apex, sometimes straight. Ovules 6-8.

A section of 18 species - *V. attenuata, V. auriculata, V. bifimbriata, V. blepharophylla, V. carinata, V. centipeda, V. drummondii, V. halophila, V. hughanii, V. lindleyi, V. luteola, V. mitodes, V. paludosa, V. pennigera, V. pholidophylla, V. spicata, V. tumida* and *V. wonganensis*. Diagnostic characters are the semiterete or concave ciliate to erose leaves, caducous bracteoles, usually ribbed hypanthium with reflexed appendages, sepals with fimbriate lobes, fimbriate or dentate petals, glandular staminodes and curved bearded style.

Verticordia sect. **Corynatoca** A.S. George, sect. nov.

Folia elliptica ad obovata marginibus translucentibus integris. Flores in turmis parvis ad apices ramulorum. Bracteolae caducae. Hypanthium turbinatum, obscure 5-costatum, appendicibus brevissimis latis. Sepalorum lobi plumosi, auriculis orbicularibus laciniatis. Petala erecta, oblongo-cuneata, apice laciniata, sine auriculis. Stamina staminodiaque breviter unita, glabra; staminodia clavata. Stylus rectus, dense barbatus. Ovuli 8.

Typus: V. ovalifolia Meissner

Leaves elliptic to obovate with translucent entire margins. Flowers in small groups towards apices of branchlets. Bracteoles caducous. Hypanthium turbinate, obscurely 5-ribbed, with very short broad appendages. Lobes of sepals plumose, with orbicular laciniate auricles. Petals erect, oblong-cuneate, with laciniate apex, without auricles. Stamens and staminodes shortly united, glabrous; staminodes clavate. Style straight, densely bearded. Ovules 8.

A monotypic section in south-western Western Australia characterised within subg. *Eperephes* especially by the 5-ribbed hypanthium with very short reflexed appendages, the oblong-cuneate laciniate petals without auricles, and the unusual clavate staminodes.

Etymology. Named from the Greek *koryne* (a club) and *atokos* (barren), in reference to the distinctive staminodes.

Verticordia sect. **Pennuligera** Meissner, J. Proc. Linn. Soc., Bot., 1: 44 (1857). *Lectotype* (here chosen): *V. grandis* Drummond

Diplachne sect. *Schizanthera* Kuntze, Lex. Gen. Phan. 177 (1903).Based on *Verticordia* sect. *Catocalypta* sensu G. Bentham (1867) non (Schauer) Meissner (1856).

Typification. Meissner listed three species with his diagnosis of sect. *Pennuligera*, viz. *V. chrysostachys* Meissner, *V. oculata* Meissner and *V. grandis* Drummond. Since his brief diagnosis applies well to all three, the first-named species is selected as lectotype. The sectional name has been ignored by subsequent workers except Mueller (1859).

Usually large, openly branched shrubs. Leaves ovate, elliptic, obovate or orbicular, usually similar throughout. Floral groups spike-like or raceme-like. Bracteoles cuspidate, persistent. Hypanthium turbinate, 5-ribbed, glabrous, with 5 reflexed appendages. Sepals with plumose lobes and peltate auricles covering hypanthium. Petals ovate, oblong or orbicular, fimbriate or rarely entire, with basal fimbriate auricles, inserted on base of androecium. Stamens uniform, erect to incurved; anthers extrorse to horizontal; staminodes linear, subulate or occasionally clavate. Style often excentric, straight to curved or geniculate, hairy below small stigma. Ovules 6-12.

A section of 14 species - *V. albida, V. argentea, V. chrysostachys, V. comosa, V. dichroma, V. etheliana, V. forrestii, V. fragrans, V. grandis, V. lepidophylla, V. muelleriana, V. oculata V. serotina* and *V. venusta.* Twelve occur between Moora and Shark Bay, W.A., and two species in north-western W.A. between Carnarvon, North West Cape and the Kennedy Range.

Systematic infrageneric classification

Verticordia

subg. **Chrysoma**

sect. **Chrysoma**
acerosa, citrella, subulata, endlicheriana

sect. **Jugata**
chrysanthella, chrysantha, galeata, brevifolia, coronata, amphigia, laciniata

sect. **Unguiculata**
nobilis, grandiflora, rutilastra

sect. **Sigalantha**
serrata, integra

sect. **Chrysorhoe**
patens, nitens, aurea

sect. **Cooloomia**
cooloomia

sect. **Synandra**
staminosa

subg. **Verticordia**

sect. **Verticordia**
crebra, helichrysantha, plumosa, stenopetala, sieberi, harveyi, pityrhops, fimbrilepis

sect. **Corymbiformis**
polytricha, densiflora, brownii, eriocephala, capillaris

sect. **Micrantha**
vicinella, minutiflora, fastigiata

sect. **Infuscata**
oxylepis, longistylis

sect. **Elachoschista**
verticordina

sect. **Penicillaris**
dasystylis, penicillaris

sect. **Pilocosta**
huegelii, brachypoda, multiflora

sect. **Catocalypta**
roei, inclusa, insignis, habrantha, lehmannii, pritzelii
sect. **Platandra**
gracilis
sect. **Recondita**
humilis
sect. **Intricata**
monadelpha, mitchelliana, pulchella

subg. **Eperephes**
sect. **Integripetala**
helmsii, rennieana, interioris, picta
sect. **Tropica**
cunninghamii, verticillata, decussata
sect. **Jamiesoniana**
jamiesonii
sect. **Verticordella**
pennigera, halophila, blepharophylla, lindleyi, carinata, attenuata, drummondii, wonganensis, paludosa, luteola, bifimbriata, tumida, mitodes, centipeda, auriculata, pholidophylla, spicata, hughanii
sect. **Corynatoca**
ovalifolia
sect. **Pennuligera**
comosa, lepidophylla, chrysostachys, dichroma, muelleriana, argentea, albida, fragrans, venusta, forrestii, serotina, oculata, etheliana, grandis

The species

Verticordia acerosa Lindley, Sketch Veg. Swan R. vi (1839). *Lectotype* (here chosen): Swan River, Western Australia, 183-, *J. Drummond* s.n. (CGE; probable isolecto: K). *Other syntype*: Swan River, Western Australia, 183-, *J. Mangles* s.n. (CGE).

Typification. The two collections on the type sheet at CGE represent the same taxon but that by Drummond is the more complete, bearing lower leaves (which were described by Lindley) as well as upper leaves and flowers. Mangles' collection lacks lower leaves.

Verticordia acerosa is characterised by the caducous bracteoles, turbinate ribbed hypanthium, openly-fringed sepal lobes, deeply lobed petals, alternately long and short stamens, anthers with a short obtuse appendage, and fringed or dentate flat staminodes with an obscure midrib at least in the lower half.

The species has two varieties.

Staminodes fimbriate; floral leaves lanceolate to ovate ..... var. *acerosa*

Staminodes dentate; floral leaves either
lanceolate to elliptic or orbicular ..... var. *preissii* (Schauer) A.S. George

Verticordia acerosa Lindley var. **acerosa**

Floral leaves lanceolate to ovate. Staminodes fringed.

Distribution and habitat. Occurs on and adjacent to the Darling Scarp between Red Hill and Armadale, Western Australia, with a record from Boyanup. Grows close to granitic outcrops and in gravel, in open woodland and heath, and, on the coastal plain, in low-lying heath.

Flowering period. September-October.

Conservation status. Not rare or endangered.

Verticordia acerosa var. **preissii** (Schauer) A.S. George, comb. et stat. nov. - *Verticordia preissii* Schauer, in J.G.C. Lehmann, Pl. Preiss. 1: 101 (1844). *Holotype*: below 'Halfway-house', Western Australia, September 18--, *L. Preiss* 175 (LD; iso: FI, G, K, KW, L, P, W).

Floral leaves lanceolate to elliptic, or broadly elliptic to orbicular. Staminodes dentate.

Distribution and habitat. Occurs mainly on the Darling Plateau east of Perth, extending N to Mogumber, E to Tammin, and S and SE to Arthur River and the Oldfield River, Western Australia; a few records on the eastern coastal plain near Perth. Grows in sandy gravel and on clay flats, in heath and low open woodland.

Flowering period. September-October.

Conservation status. Not rare or endangered.

Verticordia acerosa var. *preissii* is variable. In its typical form it has lanceolate to narrowly elliptic floral leaves and stiff petal lobes, and is of similar size in floral parts to var. *acerosa*. This form occurs mainly on the Darling Plateau to the E and N of var. *acerosa*, with some populations within the distribution of var. *acerosa*, e.g. Cannington, 27 September 1900, *A. Morrison* s.n. (BM, PERTH).

Further inland it usually has broadly elliptic to orbicular thick floral leaves, slightly smaller flowers, shorter stamens, shorter and broader staminodes, and more slender petal lobes. Collections with very broad staminodes include 99 mile peg [c. 158 km], Great Eastern Highway, 5 September 1966, *E.M. Scrymgeour* [*Bennett*] 663 (PERTH); Cunderdin, August 1903, *W.V. Fitzgerald* (PERTH); W of Woodanilling, 25 August 1970, *H. Demarz* 2539 (PERTH); and *N.G. Marchant* 71/581 (PERTH).

The name *V. preissii* has been widely misapplied to *V. endlicheriana* Schauer and the species described below as *V. chrysanthella*.

Verticordia albida A.S. George, sp. nov.

Ad *Verticordiam chrysostachydem* Meissner affinis, a qua floribus albidis (raro roseis) in centro roseis, petalis brevioribus latioribus, staminibus parce glandulosis, et stylo minus curvato ad apicem undique piloso pilis ± sparsis, differt. Petala 4-5 mm longa, 3-4 mm lata. Stylus 6-6.5 mm longus pilis 0.5-0.7 mm longis.

Typus: [S]W of Three Springs, Western Australia, c. 29° 36' S, 115° 41' E, 17 December 1962, *F. Lullfitz* 1934 (holo: PERTH; iso: B).

Related to *V. chrysostachys* from which it differs in the flowers white (rarely pink) with pink centre, petals shorter and broader, stamens sparsely glandular, and style less curved and with ± sparse hairs surrounding the upper style. Petals 4-5 mm long, 3-4 mm wide. Style 6-6.5 mm long with hairs 0.5-0.7 mm long.

Distribution and habitat. Recorded from a small area SW of Three Springs, south-western Western Australia (Figure 32). Grows in grey to yellow sand over gravel, in shrubland.

Flowering period. Late November-January.

Conservation status. 2E. The few records are from road verges in a well-cleared area.

Etymology. From the Latin *albidus* (whitish), in reference to the sepals and petals.

This new species of the '*chrysostachys*' group of *Verticordia* sect. *Pennuligera* is distinguished by the whitish flowers with pink centres, the almost orbicular petals and the curved upper part of the style with a surrounding beard of rather sparse hairs 0.6-0.7 mm long.

Verticordia amphigia A.S. George, sp. nov.

Ad *Verticordiam chrysantham* Endl. affinis, a qua foliis gracilioribus, bracteolis fimbriatis late naviculiformibus, floribus minoribus (sepala 2-2.5 mm longa et 5-7-lobata, petala 2.5 mm longa), antheris parvis (0.3 mm longa) et staminodiis anguste triangularibus 1.3-1.7 mm longis, differt.

Typus: S of Cockleshell Gully, Western Australia, 30° 11' S, 115° 07' E, 16 October 1984, *A.S. George* 16318 & *E.A. Berndt* (holo: PERTH; iso: CANB, K).

Related to *V. chrysantha*, differing in the more slender leaves, the broadly boat-shaped fimbriate bracteoles, the smaller flowers, small anthers and narrowly triangular staminodes. Sepals 2-2.5 mm long, 5-7-lobed. Petals 2.5 mm long. Anthers 0.3 mm long. Staminodes 1.3-1.7 mm long.

Distribution and habitat. Recorded from several localities at and near Cockleshell Gully and near Eneabba, Western Australia (Figure 32). Grows in winter-damp sandy loam, clay and rocky loam in low shrubland.

Flowering period. October-early November.

Conservation status. 2RC. All populations are in conservation reserves and one numbers several hundred plants.

Eytmology. Named from the Greek *amphigyos* (pointed at both ends), in reference to the boat-shaped pair of bracteoles subtending each flower. In the dried state these sometimes resemble pixie ears.

Verticordia argentea A.S. George, sp. nov.

Inter species *Verticordiae* sect. *Pennuligerae* floribus pallide roseis fimbriis loborum sepalorum albo-argentiis et stylo ± recto, praecipue differt. Folia transverse ovata ad orbicularia, 4-7 mm longa, 3.5-8 mm lata. Pedunculi 1-1.5 mm longi. Sepala 4-5 mm longa lobis 7-10. Petala 5-5.5 mm longa, 3-4 mm lata, fimbriis acutis ad 2 mm longis. Stylus 4.5-5 mm longus pilis c. 0.3 mm longis.

Typus: S of Eneabba, Western Australia, 29° 53' S, 115° 18' E, 24 January 1979, *B. Barnsley* 892 (holo: PERTH; iso: CBG).

Distinguished within *Verticordia* sect. *Pennuligera* especially by the pale pink flowers with silver-white fringe to the sepals and by the ± straight style. Leaves transversely ovate to orbicular, 4-7 mm long, 3.5-8 mm wide. Peduncles 1-1.5 mm long. Sepals 4-5 mm long with 7-10 lobes. Petals 5-5.5 mm long, 3-4 mm wide, with acute fimbriae to 2 mm long. Style 4.5-5 mm long with hairs c. 0.3 mm long.

Distribution and habitat. Restricted to an area S of Eneabba, Western Australia (Figure 33). Grows in grey and brown sand in shrubland, sometimes with open woodland of *Eucalyptus todtiana*.

Flowering period. Mainly November-March.

Conservation status: 2E. The populations are apparently small.

Etymology. From the Latin *argenteus* (silvery) in reference to the prominent fringe of the sepal lobes.

Verticordia argentea is closely related to *V. muelleriana* and is distinguished especially by the pale pink and silver flowers and the straight style with a beard of short hairs over the upper third. The staminodes are shorter than the stamens and have few oil glands. The species has a long flowering period, extending through summer to early autumn. In morphology it is quite uniform, but the pink colouration of the flowers varies somewhat in intensity, and cream flowers have been recorded (*Griffin* 825, PERTH).

Verticordia attenuata A.S. George, sp. nov.

Ab speciebus aliis *Verticordiae* sect. *Verticordellae* petalis multo angustatis ad apicem fimbriatis, et stylo crasso (ad medium 0.3-0.4 mm lato) praecipue differt.

Typus: Ludlow, Western Australia, c. 33° 37' S, 115° 29' E, 8 January 1971, *A.S. George* 10617 (holo: PERTH; iso: CANB, K).

Differs from other species of *Verticordia* sect. *Verticordella* especially in the petals being markedly narrowed towards the few-fimbriate apex and in the thick style (0.3-0.4 mm wide near mid-point).

Distribution and habitat. Occurs from Bunbury S to Ludlow and Ruabon, south-western Western Australia (Figure 32). Grows in winter-wet grey sand in eucalypt woodland and shrubland.

Flowering period. December-April.

Conservation status. 2E. Known from only a few roadside populations in a relatively well-cleared area.

Etymology. Named from the Latin *attenuatus* (narrowed), in reference to the characteristically narrowed petals.

The species is closely related to *V. drummondii*. The style appears strap-like when dried.

Verticordia aurea A.S. George, sp. nov.

Ad *Verticordiam nitentem* (Lindley) Endl. affinis, a qua floribus majoribus aureis (hypanthium 1.5-2 mm longum, sepala 3.5-4 mm longa, petala 4-4.5 mm longa), staminodiis latioribus (anguste ovatis) et florescentia praecociore (October-December praecox), differt.

Typus: S of Eneabba, Western Australia, 29°54' S, 115° 16' E, 9 December 1974, *A.S. George* 12932 (holo: PERTH; iso: AD, CANB, K, MEL, NSW, PERTH).

Closely related to *V. nitens* (Lindley) Endl. from which it differs in the larger golden flowers, broader staminodes and earlier flowering period. Hypanthium 1.5-2 mm long. Sepals 3.5-4 mm long. Petals 4-4.5 mm long. Staminodes narrowly ovate.

Distribution and habitat. Occurs from c. 30 km S to c. 10 km N of Eneabba, Western Australia (Figure 34). Grows in deep sand in heath and banksia low open woodland.

Flowering period. October-early December.

Conservation status. 2RC. The species is locally common but some populations are threatened by clearing.

Etymology. From the Latin *aureus* (golden), in reference to the colour of the flowers.

Verticordia aurea is closely related to *V. nitens* but differs in the larger, golden flowers and the broader staminodes. Usually the leaves are thicker than those of *V. nitens*. The species flowers earlier, mostly October-November, in contrast to the December-January flowering period of *V. nitens*.

Verticordia auriculata A.S. George, sp. nov.

Ab speciebus *Verticordiae* sect. *Verticordellae* turmis florum parvis, floribus parvis, et auriculis prominentibus sepalorum praecipue differt. Frutex ad 50 cm altus, raro ad 70 cm, ramosissimus. Folia adpressa, 1.5-2 mm longa. Pedunculi 1.5-2 mm longi. Hypanthium 2-2.5 mm longum, costatum; appendiculi 1.5 mm longi. Sepala 4 mm longa, auriculis argenteis prominentibus. Petala 5 mm longa fimbriis ad 1.8 mm longis. Stylus 5 mm longus, ad apicem sigmoideus; barba pilis 0.5 mm longis.

Typus: NW of Perenjori, Western Australia, 29° 25' S, 116° 16' E, 20 October 1984, *A.S. George* 16417 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Differs from other species of *Verticordia* sect. *Verticordella* especially in the small groups of small flowers and the prominent auricles of the sepals. A shrub to 50 cm tall, rarely to 70 cm, much-branched. Leaves appressed, 1.5-2 mm long. Peduncles 1.5-2 mm long. Hypanthium 2-2.5 mm long, ribbed; appendages 1.5 mm long. Sepals 4 mm long, with prominent silvery auricles. Petals 5 mm long with fimbriae to 1.8 mm long. Style 5 mm long, sigmoid towards apex; beard hairs to 0.5 mm long.

Distribution and habitat. Occurs in the north-eastern agricultural areas of south-western Western Australia, mainly from Perenjori to Koorda, but also recorded from the Pindar-Yalgoo area (Figure 33). Grows in gravelly loam, sandy loam over gravel and yellow sand, in shrubland.

Flowering period. Late October-December.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *auriculatus* (auriculate, with ear-like lobes), in reference to the prominent fimbriate basal lobes of the sepals.

The prominent auricles of the sepals are diagnostic for this member of the small-flowered group of sect. *Verticordella.*

Verticordia bifimbriata A.S. George, sp. nov.

Ab speciebus *Verticordiae* sect. *Verticordellae* fimbria petalorum ipsa fimbriata et appendiculis hypanthii incrassatis apice ± acuto libero praecipue differt. Folia anguste elliptica, 1.5-4 mm longa. Pedunculi 2-2.5 mm longi. Hypanthium 2-2.5 mm longum. Sepala 5-6 mm longa lobis 6-7, auriculata. Petala 5.5-6.5 mm longa fimbria 2.5-3 mm longa. Stamina 3 mm longa. Staminodia 1.5-1.6 mm longa. Stylus 5-6 mm longus.

Typus: S of Wannamal turnoff, Great Northern Highway, Western Australia, c. 31° 11' S, 116° 11' E, 6 December 1963, *A.S. George* 6046 (holo: PERTH; iso: K). Figure 13.

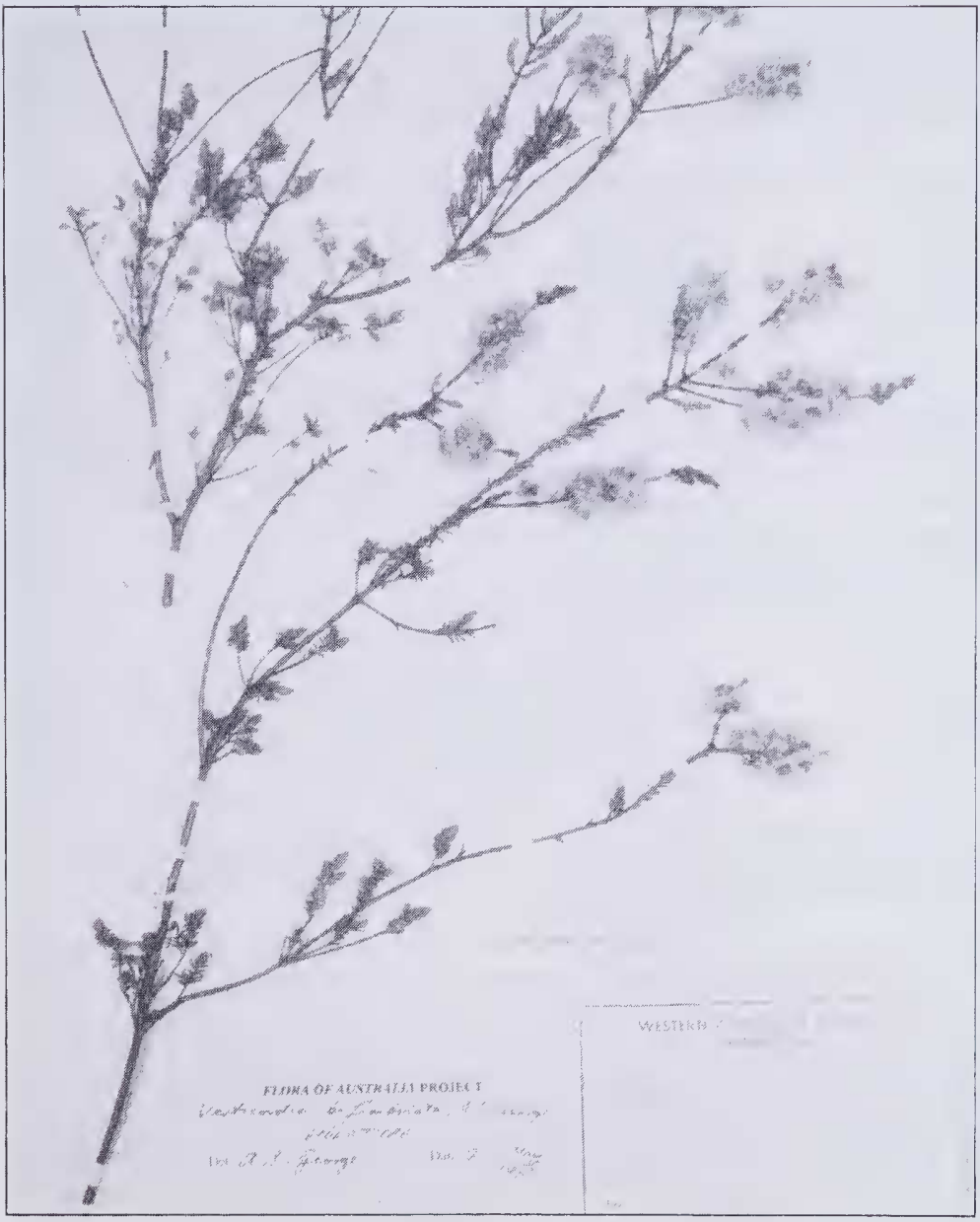

Figure 13. Holotype of *Verticordia bifimbriata*. Scale in cm.

Differs from other species of *Verticordia* sect. *Verticordella* especially in the fringe segments of the petals being themselves fimbriate and in the thick hypanthium appendages with acute free apex. Leaves narrowly elliptic, 1.5-4 mm long. Peduncles 2-2.5 mm long. Hypanthium 2-2.5 mm long. Sepals 5-6 mm long with 6 or 7 lobes, auriculate. Petals 5.5-6.5 mm long with fringe to 2.5-3 mm long. Stamens 3 mm long. Staminodes 1.5-1.6 mm long. Style 5-6 mm long.

Distribution and habitat. Occurs between Mogumber, New Norcia and Bindoon, with a record W of York and a single plant recorded at Boyagin Nature Reserve, Western Australia (Figure 32). Grows in lateritic gravel, sometimes in sand, in eucalypt open woodland.

Flowering period. Late November-January; one record in March and one in early April.

Conservation status. 2E. Known from few populations in an area being increasingly cleared.

Etymology. From the Latin *bi-* (two) and *fimbriatus* (fringed), in reference to the fringe of the petals.

The bifimbriate petal fringe distinguishes this species and *V. paludosa* among the pink-flowered taxa of sect. *Verticordella*. *V. bifimbriata* may be distinguished from *V. paludosa* especially by the presence of auricles to the sepals, by the reflexed appendages of the hypanthium being free from the hypanthium towards their apices and by the slightly larger flowers. The habitats also differ. The collections from W of York and Boyagin are atypical in having the petal fringe only slightly bifimbriate.

Verticordia blepharophylla A.S. George, sp. nov.

Ab speciebus aliis *Verticordiae* sect. *Verticordellae* foliis latibus longe ciliatis praecipue differt. Ad *V. pennigeram* Endl. arcte affinis, a qua habitu non-lignotubero, appendicibus hypanthii majoribus, sepalis sine auriculis, petalis ovatis fimbriis gracilioribus longioribus, et staminibus brevioribus, differt. Folia elliptica ad fere orbicularia, 2-5 mm longa, 2-3.5 mm lata, ciliata ciliis ad 1 mm longis. Pedunculi 1-1.5 mm longi. Hypanthium 2-2.3 mm longum, prominenter costatum, parce verrucosum; appendices reflexae, c. 1 mm longae, obtusae. Sepala 4-4.6 mm longa, lobis 5-7. Petala 4-4.5 mm longa fimbriis 1-1.5 mm longis obtusis scabridis. Stamina 1 mm longa. Stylus 3.5-5 mm longus, valde sigmoideus; barba densa pilis infimis 0.3-0.5 mm longis.

Typus: SW of Mt Adams, near Arrowsmith, Western Australia, c. 29° 27' S, 115° 08' E, 30 November 1988, *M. Pieroni* 37A (holo: PERTH, iso: AD, BRI, CANB, K, MEL, NSW, PERTH).

Differs from other species of *Verticordia* sect. *Verticordella* especially in the broad, long-ciliate leaves. Closely related to *V. pennigera* Endl., from which it differs in the non-lignotuberous habit, larger appendages of the hypanthium, sepals without auricles, ovate petals with long slender fimbriae and shorter stamens. Leaves elliptic to almost orbicular, 2-5 mm long, 2-3.5 mm wide, with cilia to 1 mm long. Peduncles 1-1.5 mm long. Hypanthium 2-2.3 mm long, prominently ribbed, sparsely verrucose; reflexed appendages c. 1 mm long, obtuse. Sepals 4-4.6 mm long, 5-7-lobed. Petals 4-4.5 mm long with obtuse scabrid fimbriae to 1-1.5 mm long. Stamens 1 mm long. Style 3.5-5 mm long, strongly sigmoid; beard dense, with hairs to 0.3-0.5 mm long.

Distribution and habitat. Occurs from the Mt Adams area S to the Badgingarra area, Western Australia (Figure 35). Grows in sand and sandy clay, in low heath and shrubland.

Flowering period. November-February.

Conservation status. 3R. Only 8 collections have been made.

Etymology. Named from the Greek *blepharis* (an eyelash) and *phyllon* (a leaf), in reference to the prominently ciliate leaves.

Populations in the Green Head Road - Hill River area have slightly larger flowers and a short petal fringe.

Verticordia brachypoda Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 158 (1847). *Lectotype* (here chosen): south-western Western Australia, 184-, *J. Drummond* 3: 28 (KW; isolecto: BM, FI, K - 2 sheets). *Other syntype*: ?Mt William, Western Australia, 1842, *J. Gilbert* 39 (KW).

Verticordia stylotricha Diels, Bot. Jahrb. 35: 403 (1904). *Lectotype* (here chosen): near Tammin, Western Australia, October 1901, *E. Pritzel* 830 (K; isolecto: BM, E, M, NSW, P). *Other syntype*: near Tammin, Western Australia, October 1901, *L. Diels* 5052 (not found).

Typification. The sheet of *V. brachypoda* at KW, annotated by Turczaninow, bears one specimen of the Drummond collection and three of the Gilbert collection. Drummond's specimen is a whole plant with his original number tag still attached and is selected as lectotype. The Gilbert specimens are smaller, with few flowers, though representing the same taxon.

No type sheet of *V. stylotricha* annotated by Diels has survived at B. The sheet at K selected as lectotype is annotated in Diels' hand.

Verticordia brevifolia A.S. George, sp. nov.

Ad *Verticordiam chrysantham* Endl. affinis, a qua lignotubero, foliis brevioribus (3-7 mm longis) crassis, antherorum loculis et appendiculibus aequilongis, et staminodiis linearibus vel lanceolatis, integris vel paucidentatis, differt.

Typus: SE of Nyabing, Western Australia, 33° 39' S, 118° 19' E, 7 November 1985, *A.S. George* 16593 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL). Figure 14.

Related to *V. chrysantha* Endl. from which it differs in having a lignotuber, shorter thick leaves (3-7 mm long), anther locules as long as the appendage, and linear or lanceolate entire or slightly dentate staminodes.

Etymology. From the Latin *brevis* (short) and *folium* (a leaf), in reference to the short leaves.

Figure 14. Holotype of *Verticordia brevifolia* subsp. *brevifolia*. Scale in cm.

There are two subspecies, distinguished on flower size.

Key to subspecies

Sepals and petals 3-3.5 mm long; Nyabing area ..... subsp. *brevifolia*

Sepals and petals 4-5 mm long; Stirling Range ..... subsp. *stirlingensis* A.S. George

Verticordia brevifolia subsp. **brevifolia**

Sepals 3-3.5 mm long. Petals 3-3.5 mm long.

Distribution and habitat. Occurs in the Nyabing area, from c. 20 km W of the town to c. 25 km to the south-east (Figure 32). Grows in gravelly clay and loam in tall shrubland with mallee eucalypts.

Flowering period. October-November.

Conservation status: 2V?C. The known populations are all on road verges.

Verticordia brevifolia subsp. **stirlingensis** A.S. George, subsp. nov.

Ab *Verticordia brevifolia* subsp. *brevifolia* floribus majoribus (sepala 4-5 mm longa; petala 4-5 mm longa) differt.

Typus: SE of Mt Trio, Chester Pass, Stirling Range National Park, Western Australia, 34° 22' S, 118° 08' E, 26 October 1984, *A.S. George* 16519 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Differs from *V. brevifolia* subsp. *brevifolia* in the larger flowers. Sepals 4-5 mm long. Petals 4-5 mm long.

Distribution and habitat. Known from three localities in the Stirling Range National Park, in Chester Pass and N of Mt Trio (Figure 32). Grows in gravelly sandy loam in open woodland of *Eucalyptus marginata* and in sandy loam with mallee shrubland.

Flowering period. October.

Conservation status. 2RC. The known records are all within a National Park.

Etymology. From the name of the Stirling Range with the Latin suffix *-ensis* (indicating origin or place).

The staminodes are usually narrower than those of subsp. *brevifolia.*

Verticordia brownii (Desf.) DC., Prodr. 3: 209 (1828). *Chamelaucium brownii* Desf., Mém. Mus. Hist. Nat. 5: 271, t.19 (1819). *Lectotype* (here chosen): Lucky Bay (E of Esperance, Western Australia), January 1802, *R. Brown* s.n. (FI; isolecto: K, NY).

Typification. The lectotype is one of two specimens on a sheet at FI. It matches Desfontaines' plate. The sheet bears a label "Ex Herb. Desfontaines", another stating "Chamelaucium brownii mem. du mus." [sic], possibly in Desfontaines' hand, and one with collection details in Brown's hand. The sheet at K has the Iter Australiense number 4568.

The name is here restricted to the pink-flowered plants occurring between Hopetoun and Mt Ragged. The widespread inland taxon previously included within *V. brownii* is described below as *V. eriocephala.*

Verticordia capillaris A.S. George, sp. nov.

Ad *Verticordiam eriocephalam* A.S. George affinis, a qua foliis semiteretibus longioribus, hypanthio ad basin densiore hirsuto, et petalis extus dense pubescentibus, differt; etiam ad *V. polytrichan* Benth. affinis, a qua praecipue floribus minoribus, hypanthio supra medium multo constricto, et stylo gracili recto glabro ad apicem purpureo, differt.

Typus: along road to The Loop, Kalbarri National Park, Western Australia, c. 27° 37' S, 114° 22' E, 18 October 1984, *A.S. George* 16385 & *R. Wemm* (holo: PERTH; iso: CANB, K, MEL).

Related to *V. eriocephala* A.S. George, from which it differs in the longer semiterete leaves, the hypanthium more densely hirsute towards the base, and the petals densely pubescent outside. Also related to *V. polytricha* Benth., from which it differs especially in the smaller flowers, the hypanthium prominently constricted above the middle and the slender glabrous style that is purple towards the apex.

Distribution and habitat. Occurs from the southern part of 'Cooloomia' S and SE through Kalbarri National Park and Yuna to S of Mullewa, Western Australia (Figure 32). Grows in sand and sandy loam over laterite, in low and tall shrubland.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *capillaris* (hair-like) in reference to the very slender style.

The most distinctive feature of *Verticordia capillaris* is its very slender, almost translucent style that is purple-tipped. The plants tend to be flatter-topped than those of *V. polytricha* and *V. eriocephala*, and the flowers are whiter. Many collections of the species have been determined previously as *V. polytricha.* Bob and Betty Wemm, of Geraldton, W.A., were the first to recognise the distinct character of the new species.

Verticordia carinata Turcz., Bull. Soc. Imp. Naturalistes Moscou 22, 2: 19 (1849). *Type*: south-western Western Australia, 184-, *J. Drummond* 4: 46 (holo: KW; iso: BM, CGE, FI, K - 4 sheets, P). Figure 15.

Verticordia carinata is here restored as an accepted species. It resembles *V. lindleyi* but is an open shrub to 1 m tall with arching branches and long-pedunculate flowers.

Until recently the species was unknown apart from the type collected in the 1840s (Figure 1) and was thought to be possibly extinct. On 5 March 1990, however, during a survey in the Stirling Range National Park, Mr Allan Rose collected a *Verticordia* that proved to be this species. The locality was further studied by Elizabeth George and Margaret Pieroni on 13 May, when the plants were still in flower. There is a single population of c. 1 000 plants, hence the conservation status would be 2RC, although the area is affected by dieback (*Phytophthora* sp.) and the species could be considered vulnerable. Since James Drummond passed through the Stirling Range in the course of the expedition on which he made his 4th Collection this may well be the same population that he found. The new material matches the type well. A diagnosis is given below.

Of particular interest in *V. carinata* is the flower which proves to be somewhat zygomorphic. The flower is held horizontally. The hypanthium and sepals are regular, but the petals, androecium and style all are irregular in arrangement. Of the petals, the two lower (abaxial) are ± erect relative to the hypathium (somewhat in the manner of the keel petals of a pea flower), while the upper three are widely spreading. Seven stamens, those toward the upper side of the flower, are upturned, one each side of the style curves laterally, and the tenth lies along the lower side of the style. The style itself is curved gently downwards to lie between the lower petals with its bearded apex exserted and upturned. The floral form appears clearly adapted for a particular pollinator. Elsewhere in the genus the only inclination towards zygomorphy is the excentric curvature of the style that occurs in some species, especially in subg. *Eperephes*.

Leaves elliptic, very concave, loosely stem-clasping, 3-4.5 mm long, ciliate. Flowers spreading to pendulous, in long raceme-like groups, magenta-pink. Peduncles 5-7.5 mm long. Hypanthium broadly turbinate, 2 mm long, ribbed, slightly verrucose; reflexed appendages rounded, 0.7-0.9 mm long. Sepals 3.5-4 mm long, the lamina 0.7-0.8 mm long; primary lobes 6 or 7, fimbriate; auricles absent, but a few reflexed cilia. Petals ovate, entire or erose, 3.3-4 mm long, 1.8-2.6 mm wide. Stamens 1.2-1.8 mm long, outcurved. Staminodes erect, 1 mm long. Style 6.5-7 mm long, exserted, curved below apex; beard surrounding style, of branched hairs c. 0.4-0.5 mm long. Ovules 6.

Distribution and habitat. Known only from the Stirling Range National Park, Western Australia. Grows in sandy loam in tall shrubland.

Flowering period. March - May.

Verticordia centipeda A.S. George, sp. nov.

Inter species *Verticordiae* sect. *Verticordellae* turmis florum plerumque parvis, floribus parvis, foliis dense sed breviter ciliatis, hypanthio favoso obscure costato, sepalis auriculis gracilibus, distinguitur. Frutex ad 50 cm altus, raro ad 1 m, aperte ramosus. Folia adpressa, 1.5-2.5 mm longa, 1-1.3 mm lata, concava. Pedunculi 2-2.5 mm longi. Hypanthium 1.5 mm longum; appendiculi 0.5 mm longi, obtusi. Sepala 3.5 mm longa. Petala 3.5 mm longa fimbriis ad 1 mm longis. Stylus 4 mm longus; barba pilis 0.5 mm longis.

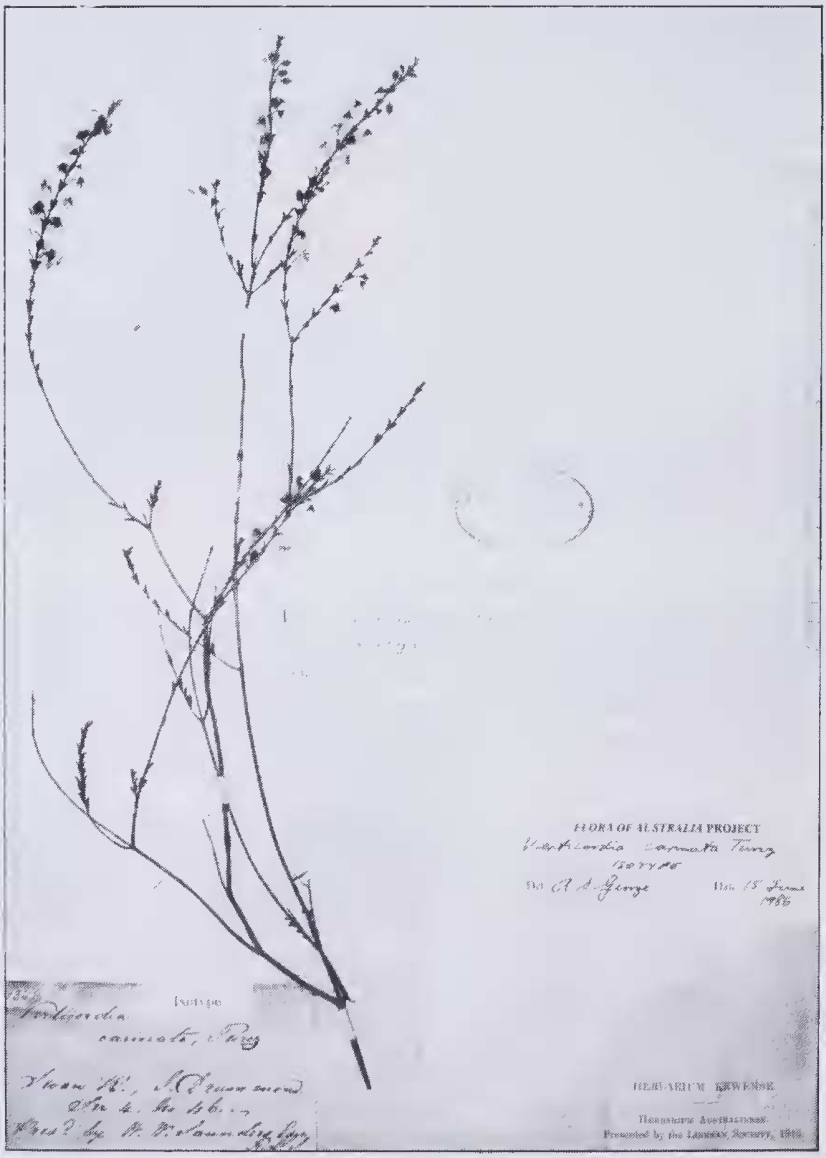

Figure 15. Isotype of *Verticordia carinata* Turcz. (K). Scale in cm.

Typus: Bunney Road S of Tomkins Road, N of Eneabba, Western Australia, 29° 31' S, 115° 27' E, 30 October 1985, *A.S. George* 16566 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL). Figure 16.

Distinguished among the species of *Verticordia* sect. *Verticordella* by the small groups of small flowers, densely but shortly ciliate leaves, the pitted, obscurely ribbed hypanthium, and the slender auricles of the sepals. A shrub to 50 cm, rarely to 1 m, openly branched. Leaves appressed, 1.5-2.5 mm long, concave. Peduncles 2-2.5 mm long. Hypanthium 1.5 mm long; reflexed appendages 0.5 mm long, obtuse. Sepals 3.5 mm long. Petals 3.5 mm long including fimbriae to 1 mm long. Style 4 mm long; beard hairs to 0.5 mm long.

Distribution and habitat. Occurs from Yuna S to Eneabba, Western Australia (Figure 37). Grows in clay-loam, sandy loam and sand over laterite, in heath.

Flowering period. October-December.

Conservation status. Not rare or endangered.

Etymology. The specific epithet refers to the neatly ciliate leaf margins resembling a millipede or small centipede.

This species is related closely to *V. auriculata* but has much less developed sepal auricles. The hypanthium is shorter.

Verticordia chrysantha Endl., Stirp. Herb. Huegel 3: 7 [1838] (1839).

Verticordia gilbertii Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 160 (1847). *Lectotype* (here chosen): possibly near Wongan Hills, Western Australia, 1842, *J. Gilbert* 11 (KW; isolecto: BM, K, W).

Typification. Selection of a lectotype for this synonym of *V. chrysantha* is necessary because there are two collections on the type sheet at KW, the second being *Gilbert* 13. From the position of the specimens and labels it is not possible to determine which is no. 11 and which no. 13, and the specimens represent two taxa. One is *V. chrysantha*, the other the species described below as *V. chrysanthella*. Correlation of specimens and numbers can be ascertained from the isolectotypes, all of which are *V. chrysantha* (the BM sheet also bears a specimen of *V. grandiflora* Endl.).

Verticordia chrysanthella A.S. George, sp. nov.

Ad *Verticordiam chrysantham* Endl. affinis, a qua habitu typice lignotubero, foliis et floribus minoribus, differt. Folia teretia vel semiteretia, uncinata, saepe verrucosa, 3-8 mm longa. Pedunculi 6-10 mm longi. Sepala 3-3.5 mm longa. Petala 3-3.5 mm longa, ad 15-lobata. Staminodia oblonga, obtusa, plerumque integra, 1.4-2.3 mm longa. Antherae 0.2-0.4 mm longae. Stylus 3-3.3 mm longus.

Typus: NE of Wongan Hills, Western Australia, 30° 51' S, 116° 48' E, 20 October 1984, *A.S. George* 16423 & *E.A. Berndt* (holo: PERTH; iso: CANB, K).

Figure 16. Holotype of *Verticordia centipeda*. Scale in cm.

Closely related to *V. chrysantha* Endl., from which it differs mainly in having a lignotuber and smaller leaves and flowers. Leaves terete or semiterete, uncinate, often warty, 3-8 mm long. Peduncles 6-10 mm long. Sepals 3-3.5 mm long. Petals 3-3.5 mm long, up to 15-lobed. Staminodes oblong, usually entire, 1.4-2.3 mm long. Anthers 0.2-0.4 mm long. Style 3-3.3 mm long.

Distribution and habitat. Widespread in south-western Western Australia from the Northampton district S through the agricultural regions to Cranbrook and E to Bonnie Rock, Hyden and the Lort River (Figure 35). Usually grows in granitic soil, in heath and low open woodland.

Flowering period. September-November.

Conservation status. Not rare or endangered.

Etymology. From the name of the species' close relative, *V. chrysantha*, with the diminutive suffix *-ella*.

Probable synonym. Verticordia chrysantha var. *preissii* Schauer, in J.G.C.Lehmann, Pl. Preiss 1: 102 (Sept. 1844). *Type*: south-western W.A., October 18--, *L. Preiss* 178 (holo: LD).

This is a variable species that should be studied in more detail. The typical form is common in the central, eastern and north-eastern wheatbelt, usually around granitic rocks. Here it is readily distinguished from *V. chrysantha* by its multi-stemmed habit and smaller leaves and flowers. Populations towards the south coast east of Ravensthorpe tend to be smaller plants with short thick leaves. North of Geraldton the plants have slightly larger leaves and flowers, thus showing a tendency towards *V. chrysantha*. The presence or absence of a lignotuber in these plants also should be investigated.

Specimens of this species have previously often been determined as *V. preissii* Schauer, a name correctly applied to a variety of *V. acerosa* (see above). The holotype of the probable synonym *V. chrysantha* var. *preissii* is a small specimen with a single peduncle bearing persistent bracteoles but the flower is missing. From the hispid stem and slender leaves it appears to be *V. chrysanthella*. The varietal epithet cannot be used at specific rank since it is preoccupied by *V. preissii* Schauer.

Verticordia chrysostachys Meissner, J. Linn. Soc., Bot. 1: 41 (1857). *Type*: south-western Western Australia, 1850/51, *J. Drummond* 6: 46 (holo: NY; iso: BM, CGE - 2 sheets, E, FI, K - 2 sheets, LD - 2 sheets, NSW, P - 3 sheets, W).

The species is characterised by the deep or pale yellow flowers on peduncles 2-4 mm long, prominent reflexed appendages on the hypanthium, sepals 4-6 mm long with 7-12 lobes, petals 5-7 mm long with an acute or obtuse fringe, staminodes c. as long as the stamens, and an exserted style 5-7 mm long with sigmoid apex and a beard of hairs 0.2-0.5 mm long. There are two varieties.

Key to varieties

Flowers deep yellow; peduncles 2.5-4 mm long;
petals 6-7 mm long including fringe of obtuse
segments c. 3 mm long; style beard hairs c. 0.2 mm long ..... var. *chrysostachys*

Flowers pale yellow; peduncles 2-2.5 mm long;
petals 5-6 mm long including fringe of acute segments
1.5-2 mm long; style beard hairs 0.3-0.5 mm long ..... var. *pallida* A.S. George

Verticordia chrysostachys Meissner var. **chrysostachys**

Leaves usually slightly glaucous. Peduncles 2.5-4 mm long. Petals 6-7 mm long with fringe of obtuse segments c. 3 mm long, prominently spotted. Style 6-7 mm long with hairs c. 0.2 mm long.

Distribution and habitat. Occurs mainly from the Northhampton area N beyond the Murchison River, but also recorded W of Mullewa (Figure 34). Grows in deep yellow sand and sandy gravel in heath.

Flowering period. November-January.

Conservation status. Not rare or endangered.

Verticordia chrysostachys var. **pallida** A.S. George, var. nov.

Ab *Verticordia chrysostachyde* var. *chrysostachyde* foliis plerumque recurvis, pedunculis 2-2.5 mm longis, floribus luteolis, petalis 5-6 mm longis fimbriis 1.5-2 mm longis acutis, et styli pilis 0.3-0.5 mm longis, differt.

Typus: near Northampton, Western Australia, c. 28° 19' S, 114° 38' E, 13 December 1987, *R. & B. Wemm* s.n. (holo: PERTH; iso: CANB).

Differs from *V. chrysostachys* var. *chrysostachys* in the usually recurved leaves, peduncles 2-2.5 mm long, pale yellow flowers, petals 5-6 mm long including acute fimbriae to 1.5-2 mm long, and the style hairs to 0.3-0.5 mm long.

Distribution and habitat. Occurs from the Northampton district to Wicherina and E towards Mullewa, Western Australia (Figure 34). Grows in deep yellow sand in heath.

Flowering period. Late October-January.

Conservation status. 2V. Known from few collections and should be investigated to check rarity.

Etymology. From the Latin *pallidus* (pale) in reference to the flower colour which is paler than that of *Verticordia chrysostachys* var. *chrysostachys*.

The variety shows some variation in most characters. In the Wicherina area there appears to be a hybrid swarm with var. *pallida* as one original parent and the other *V. muelleriana* subsp. *minor*. The plants show great variation in morphology and flower colour and should be studied in detail. They are represented by a number of collections at PERTH.

Verticordia citrella A.S. George, sp. nov.

Ad *Verticordiam acerosam* Lindley affinis, a qua foliis floribusque minoribus differt. Folia floralia elliptica ad orbicularia, 2-3 mm longa. Pedunculi 3-5 mm longi. Sepala 2 mm longa, reflexa, lobis fimbriatis. Petala 1.5-1.8 mm longa, digitata. Stamina longa 1.2 mm longa, brevia 0.8 mm. Staminodia oblonga ad spathulata, integra ad obscure dentata, obtusa vel acuta, 1.4 mm longa. Stylus 0.8 mm longus.

Typus: E of Noble Falls, Perth-Toodyay road, Western Australia, 31° 19' S, 116° 19' E, 25 October 1986, *A.S. George* 16830 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL).

Related to *V. acerosa* Lindley, differing in the smaller leaves and flowers. Floral leaves elliptic to orbicular, 2-3 mm long. Peduncles 3-5 mm long. Sepals 2 mm long, reflexed, with fimbriate lobes. Petals 1.5-1.8 mm long, digitate. Long stamens 1.2 mm long, short 0.8 mm. Staminodes oblong to spathulate, 1.4 mm long, entire to obscurely dentate, obtuse or acute. Style 0.8 mm long.

Distribution and habitat. Known from one population, growing in seasonally damp gravel-loam in scrub (Figure 32).

Flowering period. October-November.

Conservation status. 2EC. The only known population is in a Nature Reserve.

Etymology. From the Latin *citreus* (yellow, lemon-coloured), with the diminutive suffix *-ella*, in reference to the flowers which are the smallest of the taxa in sect. *Chrysoma*.

This species has much smaller floral leaves and flowers than the closest relative, *V. acerosa*. The sepals are also reflexed over the hypanthium and the lobes are fimbriate, not plumose as in *V. acerosa*.

Verticordia comosa A.S. George, sp. nov.

Ad *Verticordiam lepidophyllam* Meissner affinis, a qua foliis majoribus squarrosis, sepalis et petalis majoribus, petalis fimbriatis, stylo breviore pilis comosis, differt. Folia 2-4 mm longa. Sepala 4 mm longa. Petala 4 mm longa fimbriis 1-1.5 mm longis. Stylus 4.5-5.5 mm longus, pilis ad 0.8 mm longis.

Typus: NE of Three Springs, Western Australia, c. 29° 24' S, 115° 50' E, 16 December 1980, *C. Chapman* (holo: PERTH; iso: AD, CANB, K, MEL, NSW, PERTH).

Figure 17. Holotype of *Verticordia cooloomia*. Scale in cm.

Related to *V. lepidophylla* Meissner, from which it differs in the larger squarrose leaves, larger sepals and petals, prominently fimbriate petals, and shorter style with a comose beard. Leaves 2-4 mm long. Sepals 4 mm long. Petals 4 mm long including fimbriae to 1-1.5 mm long. Style 4.5-5.5 mm long, with beard hairs to 0.8 mm long.

Distribution and habitat. Restricted to a small area between Three Springs and Morawa, Western Australia (Figure 34). Grows in yellow sand and in greyish-yellow sand over gravel, in heath.

Flowering period. October-December.

Conservation status. 2E. The few records are from road verges in a heavily-cleared area.

Etymology. From the Latin *comosus* (having a tuft of hairs) in reference to the hairs of the style.

The species is closely related to *V. lepidophylla* in having channelled, slightly flared staminodes and small lemon-yellow flowers. The petals, however, are prominently fimbriate, the leaves squarrose, the sepals and petals slightly larger but the style shorter with a tufted beard. The two species are geographically disjunct. In one collection (23.5 km NE of Three Springs, 28 October 1981, *C. Chapman* s.n., (PERTH)), the leaves are almost appressed, 2-4 mm long and white-margined, the flowers are creamy white, and the style hairs are less tufted. This may be a hybrid between *V. comosa* and *V. spicata* subsp. *squamosa*.

Verticordia cooloomia A.S. George, sp. nov.

Species bene distincta, ad *Verticordiam* sect. *Chrysorhoen* affinis, sed foliis trimorphis, sepalis breviter fimbriatis quam petala minoribus, et antherae appendicula grandi cucullata ciliata, praecipue distinguitur. Folia infima linearia, semiteretia, crebra; folia caulis anguste lanceolata, concava; folia floralia orbicularia, concava. Pedunculi 10-18 mm longi. Hypanthium late turbinatum, obscure 10-costatum, glabrum. Sepala 2 mm longa, aurea. Petala orbicularia, 3-4 mm longa, erosa, aurea. Stamina 2-2.2 mm longa, aequilonga. Staminodia linearia, integra, 1.5-1.8 mm longa. Stylus 3-5 mm longus, glaber.

Typus: near N boundary of Murchison House Stn, Western Australia, c. 27° 15 'S, 114° 15' E, 29 October 1986, *A.S. George* 16843 & *E.A. George, P. Roberts & K. Miller* (holo PERTH; iso: CANB, K, MEL, PERTH). Figure 17.

A remarkable species distinguished by the three leaf forms, yellow flowers with shortly fimbriate sepals and erose petals, and large cucullate ciliate anther appendages. Lowest leaves linear, semiterete, crowded; stem leaves narrowly lanceolate, concave; floral leaves orbicular, concave. Flowers in corymb-like groups. Peduncles 10-18 mm long. Hypanthium broadly turbinate, obscurely 10-ribbed, glabrous. Sepals 2 mm long. Petals orbicular, 3-4 mm long, erose. Stamens 2-2.3 mm long, of equal length. Staminodes linear, entire, 1.5-1.8 mm long. Style 3-5 mm long, glabrous.

Distribution and habitat. Occurs in Cooloomia Nature Reserve and Murchison House pastoral station, N of the lower Murchison River, Western Australia (Figure 33). Grows on sandy rises in tall open shrubland with *Banksia sceptrum, Acacia, Calothamnus*, etc.

Flowering period. October-November.

Conservation status. 2RC. Two populations are known.

Etymology. Cooloomia is the name of the area in which the species occurs.

The flowers have a strong unusual perfume that persists in dried specimens.

Verticordia coronata A.S. George, sp. nov.

Ad *Verticordiam chrysantham* Endl. affinis, a qua lignotubero, foliis floralibus ellipticis-oblongis concavis crassis, hypanthio non vel parce verrucoso, anthera et appendicula aequilonga, et staminodiis magnis latis integris, differt.

Typus: Salt River road, Stirling Range National Park, Western Australia, 34° 20' S, 117° 52' E, 26 October 1984, *A.S. George* 16526 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Related to *V. chrysantha* Endl., differing in the presence of a lignotuber, the floral leaves elliptic-oblong, concave and thick, the hypanthium not or slightly verrucose, the anther locules and appendage of equal length, and especially the large broad entire staminodes.

Distribution and habitat. Occurs in the Stirling Range National Park W of Chester Pass and N of the range, extending W to Cranbrook and N to the Katanning area, Western Australia (Figure 33). Grows in clay loam, clay and sandy loam, sometimes gravelly, in open mallee shrubland and heath, sometimes in Wandoo woodland.

Flowering period. October-November.

Conservation status. 2RC.

Etymology. From the Latin *coronatus* (crowned), in reference to the prominent staminodes that form a crown-like centre to the flower after anthesis.

The prominent broad entire staminodes distinguish *Verticordia coronata* from its close relatives *V. chrysantha* and *V. brevifolia*. Like the latter species, it differs from *V. chrysantha* in having a small lignotuber and short, thick leaves. One collection, *A.S. George* 16591, has the flowers smaller than in typical plants.

Verticordia crebra A.S. George, sp. nov.

Ad *Verticordiam helichrysantham* F. Muell. ex Benth. affinis, a qua foliis longioribus (ad 14 mm longis) gracilioribus, longe petiolatis (1-2.5 mm longis), sepalis ± glabris, petalis orbicularibus glabris, staminodiis minoribus sed latioribus minus glandulosis, et stylo longiore (18-22 mm longo), differt.

Figure 18. Holotype of *Verticordia crebra*. Scale in cm.

Typus: near Twertup Creek, near Fitzgerald River, Fitzgerald River National Park, Western Australia, c. 34° 00' S, 119° 21' E, 11 July 1970, *A.S. George* 9905 (holo: PERTH; iso: CANB, K, MEL, NSW, PERTH). Figure 18.

Related to *V. helichrysantha* F. Muell. ex Benth., from which it differs in the longer, more slender leaves with long petiole, the ± glabrous sepals, the orbicular glabrous petals, the smaller but broader less glandular staminodes, and the longer style. Leaves 4-14 mm long; petiole 1-2.5 mm long. Flowers pale yellow. Peduncles 2-3 mm long. Sepals 4 mm long. Petals 2.8-3 mm long, erose. Style 18-22 mm long.

Distribution and habitat. Endemic in the Fitzgerald River National Park where recorded near Twertup Creek and Middle Mt Barren, Western Australia (Figure 32). Grows on rocky, spongolite outcrops, in low open heath.

Flowering period. July-September.

Conservation status. 2RC.

Etymology. From the Latin *creber* (numerous, close together), in reference to the crowded leaves.

This species is closely related to *V. helichrysantha* but is readily distinguished by the long slender leaves, ± glabrous sepals, orbicular petals, small staminodes with less evident oil glands and the longer style.

Verticordia dasystylis A.S. George, sp. nov.

Ad *V. penicillarem* F. Muell. affinis, a qua habitu et floribus minoribus, praecipue stylo breviore sed magis piloso, differt. Folia breviter setosa vel erosa. Pedunculi 3-7 mm longi. Sepala 4-7 mm longa lobis 5-7 profunde fimbriata. Petala 2-3 mm longa. Staminodia 0.7-2.5 mm longa. Stylus 7-9 mm longus, per 2/3-3/4 longitudinem albo-pilosus.

Typus: N of Yellowdine, Western Australia, 31° 10' S, 119° 41' E, 22 September 1969, *A.S. George* 9638 (holo: PERTH; iso: CANB, K, MEL, NSW, PERTH). Figure 19.

Related to *V. penicillaris* F. Muell., from which it differs in the smaller habit and flowers and especially in the shorter but more pilose style. Leaves shortly setose or erose. Peduncles 3-7 mm long. Sepals 4-7 mm long, 5-7-lobed, deeply fimbriate. Petals 2-3 mm long. Staminodes 0.7-2.5 mm long. Style 7-9 mm long, white-pilose for 2/3-3/4 its length.

Etymology. From the Greek *dasys* (hairy, shaggy), and *stylos* (style), in reference to the very hairy style.

Although closely related to *V. penicillaris*, this species is readily distinguished by the shorter style bearing white hairs for 2/3-3/4 its length. *V. penicillaris* has a style 15-19 mm long with purple hairs only in the upper third. The divisions of the sepal lobes of *V. dasystylis* are not divaricate as are those of *V. penicillaris*. *Verticordia dasystylis* has three subspecies recorded from widely disjunct areas.

Figure 19. Holotype of *Verticordia dasystylis* subsp. *dasystylis*. Scale in cm.

Key to subspecies

1a Staminodes 0.7 mm long; Arrowsmith River ..... subsp. *oestopoia* A.S. George

1b Staminodes 1.2-2.5 mm long

2a Staminodes 1.2-2 mm long; peduncles 1.5-4 mm long; petals 2-2.5 mm long; Yilgarn district ..... subsp. *dasystylis*

2b Staminodes 2.1-2.5 mm long; peduncles 4-7 mm long; petals 3 mm long; Kalbarri National Park ..... subsp. *kalbarriensis* A.S. George

Verticordia dasystylis A.S. George subsp. **dasystylis**

Shrub to 40 cm with many stems but no lignotuber. Leaves oblong or elliptic, obtuse, 2-3.5 mm long, shortly setose. Peduncles 1.5-4 mm long. Sepals 4 mm long. Petals 2.5 mm long, fimbriate, yellow. Stamens 1.2-1.5 mm long. Staminodes linear, 1.2-2 mm long. Style 6.5-7 mm long, pilose with white hairs in upper 2/3.

Distribution and habitat. Recorded from three localities in the Yellowdine area, Western Australia (Figure 33). Grows in shallow granitic clay-loam in exposed sites, with *Borya*.

Flowering period. Late September-early November.

Conservation status. 2RC. The populations are all in conservation reserves.

Verticordia dasystylis subsp. **kalbarriensis** A.S. George, subsp. nov.

Ab subspeciebus aliis *Verticordiae dasystylidis* staminodiis 2.2-2.5 mm longis praecipue differt. Folia 1.5-4 mm longa, erosa. Pedunculi 4-7 mm longi. Sepala 4-4.5 mm longa. Petala 3 mm longa. Staminodia 2.1-2.5 mm longa. Stylus 8-9 mm longus.

Typus: S boundary of Kalbarri National Park, W of Mount View Stn homestead, Western Australia, c. 27° 56' S, 114° 22' E, 18 October 1987, *D. & B. Bellairs* s.n. (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Differs from the other subspecies of *V. dasystylis* mainly in the longer staminodes. Leaves 1.5-4 mm long, erose. Peduncles 4-7 mm long. Sepals 4-4.5 mm long. Petals 3 mm long. Staminodes 2.1-2.5 mm long. Style 8-9 mm long.

Distribution and habitat. Recorded only from the type locality, where there are c. 100 plants growing in a clay-silt winter-wet area in sandplain (Figure 33).

Flowering period. October-November.

Conservation status. 2RC.

Etymology. Taken from the name of the Kalbarri National Park, with the suffix *-ensis* (indicating origin or place).

The flower size and especially the hairy style 8-9 mm long place this taxon with *V. dasystylis*, though the staminode length approaches that of *V. penicillaris*.

Verticordia dasystylis subsp. **oestopoia** A.S. George, subsp. nov.

Ab subspeciebus aliis *Verticordiae dasystylidis* staminodiis 0.7 mm longis praecipue differt. Folia 1.5-4 mm long-a, setosa-erosa. Pedunculi 3-6 mm longi. Sepala 6-7 mm longa. Petala 3 mm longa. Staminodia 0.7 mm longa. Stylus 8 mm longus.

Typus: S of Arrowsmith River on Eneabba-Mingenew road, Western Australia, c. 29° 33' S, 115° 27' E, 21 October 1982, *C. Chapman* 52C (holo: PERTH); same locality and date, *C.Chapman* 52A (syn: CANB), and 52B (syn: K).

Differs from the other subspecies of *V. dasystylis* mainly in the very short staminodes. Leaves 1.5-4 mm long, setose to erose. Peduncles 3-6 mm long. Sepals 6-7 mm long. Petals 3 mm long. Staminodes 0.7 mm long. Style 8 mm long.

Distribution and habitat. Known only from the type locality. Grows in shallow gritty soil over granite (Figure 33).

Flowering period. October.

Conservation status. 1E(?X). Searches in 1987 and 1989 failed to locate this population.

Etymology. From the Greek *oistos* (arrow) and *poieo* (to make or work), in reference to the name of the Arrowsmith River.

The short staminodes readily distinguish this subspecies.

Verticordia densiflora Lindley, Sketch Veg. Swan R. vi (1839). *Lectotype* (here chosen): Swan River, W.A., 183-, *J. Drummond* s.n. (CGE).

Typification. The sheet annotated by Lindley at CGE bears three collections, all of which fit the description in the protologue. Drummond's specimen is the best and is selected as lectotype. The syntypes, also from the Swan River, are annotated with the collectors' names Toward and Mangles.

Like *Verticordia plumosa, V. densiflora* is extremely widespread and variable. It is here divided into five varieties based on differences in habit, leaves and flower size. *Verticordia stelluligera* is here transferred to *V. densiflora* as a variety. Its floral morphology is similar, and the taxon described below as var. *roseostella* is a connecting link with the other varieties.

Key to varieties

1a Longest peduncles 5-9 mm long; sepals 3.8-4 mm long; petals 1.6-2 mm long ..... var. *pedunculata* A.S. George

1b Longest peduncles 1.5-4 mm long; sepals 2-3.5 mm long; petals 0.8-1.9 mm long

2a Flower groups small, ± rounded; floral leaves 2-2.5 mm wide

3a Flowers pink or pink and cream ..... var. *roseostella* A.S. George

3b Flowers yellow or cream ..... var. *stelluligera* (Meissner) A.S. George

2b Flower groups corymb-like; floral leaves 0.8-1.2 mm wide

4a Sepals 2-2.2 mm long; petals 0.8-1 mm long ..... var. *densiflora*

4b Sepals 2.5-3.5 mm long; petals 1.3-1.9 mm long var. *cespitosa* (Turcz.) A.S. George

Verticordia densiflora Lindley var. **densiflora**

Shrub to 80 cm tall with open main branches but usually dense corymb-like flowering branchlets. Floral leaves linear to ovate, 0.8-1.3 mm wide. Peduncles 1.5-2.5 mm long. Style 5-6 mm long.

Distribution and habitat. Widespread in south-western Western Australia from near Geraldton to Collie, and inland to Wongan Hills, Tammin and Ongerup. Grows in sand, sandy loam, clay and gravelly soil, often on low-lying flats, in shrubland and woodland.

Flowering period. October-January.

Conservation status. Not rare or endangered.

The typical form of *Verticordia densiflora* var. *densiflora* is that occurring on the coastal plain west of the Darling Scarp. This has narrow floral leaves. Inland populations tend to have shorter, broader floral leaves; these and some northern collections show a gradation towards var. *cespitosa* in the slightly larger flowers, e.g. Northam, 1900, *J.H.Gregory* (PERTH). Some northern populations have broader floral leaves, thus tending towards var. *roseostella*.

Verticordia densiflora Lindley var. **cespitosa** (Turcz.) A.S. George, comb. et stat. nov. *Verticordia cespitosa* Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 157 (1847). *Type*: south-western Western Australia, 1842, *J. Gilbert* 330 (holo: KW).

Shrub with fire-tolerant rootstock and several stems to 70 cm tall, or without rootstock and to 1 m tall. Flowers in corymb-like groups. Floral leaves 1-1.5 mm wide. Peduncles 2-3 mm long, sometimes to 4 mm. Sepals 2.5-3.5 mm long. Petals 1.2-1.9 mm long. Style 5-6 mm long.

Distribution. Widespread in south-western Western Australia from Eneabba to the Kalgan Plains and E to Dowerin and Ravensthorpe (Figure 38).

Flowering period. October-January.

Conservation status. Not rare or endangered.

This taxon requires further study to determine whether it should be divided. Typical *Verticordia densiflora* var. *cespitosa* has a fire-tolerant rootstock from which it sprouts after fire. It then develops several stems to 70 cm tall. The flowers, in the few specimens seen with such a rootstock, are slightly larger than those of many other collections here placed in the variety. Most southern collections have these larger flowers and possibly are from plants with persistent rootstocks, but there is no indication that this is so either from the specimens or from the collectors' notes.

Collections with recorded persistent rootstocks include (besides the type): Mt Saddleback, 30 January 1981, *D. Halford* 810191 (PERTH); 7 miles [c. 11 km] ENE of Yanchep Forestry Headquarters, 27 January 1965, *Y. Chadwick* 2559 (PERTH); near Wadjekanup River, NW of Tambellup (in bud), 5 November 1986, *A.S. George* 16880 & *E.A. George* (PERTH).

Northern populations have flowers with sepals usually 2.5-3 mm long. The floral leaves are also sometimes broader, indicating a tendency towards var. *roseostella*, e.g. 19 km WSW of Winchester, *C. Chapman* (PERTH).

Intermediate between *Verticordia densiflora* var. *cespitosa* and var. *densiflora* are: 4.8 km E of Gunyidi, 16 January 1982, *P. Armstrong* 82/7 (PERTH); Hindmarsh Reserve, 19 November 1983, *M. Smith* 71 (PERTH).

The epithet was spelt *cespitosa* by Turczaninow both in the protologue and on the holotype sheet.

Verticordia densiflora Lindley var. **pedunculata** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae densiflorae* pedunculis longioribus et floribus majoribus differt. Frutex ad 60 cm altus. Ramuli florales corymbosi. Folia floralia lanceolata, 1-1.5 mm lata. Pedicelli 5-9 mm longi. Sepala 3.8-4 mm longa. Petala 1.6-2 mm longa. Stylus 5-6 mm longus.

Typus: between Ruabon and Tutunup, 25 km E of Busselton, Western Australia, 27 December 1981, *D. Cooper* s.n. (holo: PERTH; iso: CANB).

Differs from the other varieties of *V. densiflora* in the longer pedicels and larger flowers. A shrub to 60 cm tall. Floral branchlets corymbose. Floral leaves lanceolate, 1-1.5 mm wide. Peduncles 5-9 mm long. Sepals 3.8-4 mm long. Petals 1.6-2 mm long. Style 5-6 mm long.

Distribution and habitat. Occurs S and E of Busselton near Kalgup and Ruabon (Figure 38). Grows in winter-wet sandy loam.

Flowering period. December-January.

Conservation status. 2E. Known from few collections from road verges in a well-cleared area.

Etymology. From the Latin *pedunculatus* (pedunculate), in reference to the long peduncles which are a distinctive character.

The variety in its typical form is known from only two collections. Another collection, Lake View Road, 33 km E of Manjimup, 29 December 1983, *A.R. Annels* 1767 (PERTH), is tentatively included in the variety; it has the same large flowers but the longest peduncles are 5 mm long.

Verticordia densiflora var. **roseostella** A.S. George, var. nov.

Ad *Verticordiam densifloram* var. *stelluligeram* similis, a qua sepalis et petalis caryophyllaceis differt. Ab var. *densiflora* et var. *cespitosa* habitu aperte ramoso et foliis floralibus latioribus differt. Frutex ad 1.3 m altus. Folia floralia anguste ovata, 1.5-2 mm lata. Pedunculi plerumque 2-4 mm longi. Sepala 2.3-2.6 mm longa.

Typus: Burma Road, N of Strawberry North East Road, Western Australia, c. 29° 10' S, 115° 15' E, 28 October 1986, *A.S. George* 16835 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL).

Similar to *V. densiflora* var. *stelluligera*, from which it differs in the pink sepals and petals. Differs from var. *densiflora* and var. *cespitosa* in the openly branched habit and broader floral leaves. A shrub to 1.3 m. Floral leaves narrowly ovate, 1.5-2 mm wide. Peduncles usually 2-4 mm long. Sepals 2.3-2.6 mm long.

Distribution and habitat. Occurs from the Kalbarri area S to the Winchester area (Figure 39). Grows in deep sand and sand over gravel, in tall shrubland.

Flowering period. October-December.

Conservation status. 3R.

Etymology. From the Latin *roseus* (rose-pink) and *stella* (a star), in reference to the flower colour and the similarity of the taxon to *Verticordia densiflora* var. *stelluligera.*

This variety forms a morphological and geographical link between the yellow-flowered var. *stelluligera* and the other varieties, all of which are pink-flowered and occur mostly to the south.

Verticordia densiflora var. **stelluligera** (Meissner) A.S. George, comb. et stat. nov.

Verticordia stelluligera Meissner, J. Linn. Soc., Bot. 1: 38 (1857). *Type*: south-western Western Australia, 1850/51, *J. Drummond* 6: 50 (holo: NY; iso: BM, CGE, E, FI, K, MEL, NSW, W).

Shrub to 2 m tall, openly and widely branched. Flowering branchlets usually short, cluster-like. Lower floral leaves ovate, concave, usually 2-2.5 mm wide. Lower peduncles 1.5-2 mm long, sometimes to 4 mm. Sepals 2.4-2.6 mm long. Petals 1.4-1.7 mm long. Style 4-5 mm long.

Distribution and habitat. Occurs from Kalbarri S to near Morawa, Western Australia (Figure 38). Grows in deep sand in shrubland.

Flowering period. October-December.

Conservation status. Not rare or endangered.

This taxon is here reduced to varietal status within *V. densiflora.* The floral morphology is very similar to that of the other varieties, and only flower colour is a reliable difference from var. *roseostella.*

Some collections have larger flowers (sepals 3-3.2 mm long, petals 2-2.3 mm long), e.g. W of Morawa, 27 October 1981, *A. Heitman & A. Lane* (PERTH); Kalbarri, 17 October 1979, *R. & B. Wemm* s.n. (PERTH). A population at Wicherina contains both cream- and pinkish-flowered plants.

Verticordia dichroma A.S. George, sp. nov.

Ad *Verticordiam chrysostachydem* Meissner affinis, a qua pedunculis brevioribus, floribus sanguineis et aureis, et pilis styli paucioribus sed longioribus, praecipue differt. Pedunculi 1.5-2 mm longi. Pili styli ad 0.7-0.9 mm longi.

Typus: W of North West Coastal Highway, N of No. 8 Tank, Western Australia, 29 October 1986, *A.S. George* 16854 & *E.A. George* (holo: PERTH; iso: AD, CANB, K, MEL, NSW). Figure 20.

Closely related to *V. chrysostachys*, from which it differs especially in the shorter peduncles, deep red and golden flowers, and the fewer but longer hairs of the style. Peduncles 1.5-2 mm long. Style hairs to 0.7-0.9 mm long.

Distribution. Occurs mainly in the eastern half of Kalbarri National Park, Western Australia, extending a short distance northwards and southwards.

Etymology. Named from the Greek *di-* (two) and *chroma* (colour), in reference to the flowers which are red and yellow at anthesis.

There are 2 varieties.

Key to varieties

Leaves mostly 3-4 mm long, strongly reclinate to recurved;
sepals usually 5-6 mm long; petals 6-7 mm long, the fringe
2-2.5 mm long; flowers in groups often of 12 or more ..... var. *dichroma*

Leaves mostly 2-3 mm long, moderately reclinate;
sepals ± 4 mm long; petals 5-6 mm long, the fringe
1.5-2 mm long; flowers in groups often of fewer than 10 ..... var. *syntoma* A.S.George

Verticordia dichroma A.S. George var. **dichroma**

Leaves usually 3-4 mm long, strongly reclinate to recurved. Flowers in groups often of 12 or more. Sepals usually 5-6 mm long. Petals 6-7 mm long, the fringe 2-2.5 mm long.

Distribution. As for the species (Figure 36). Grows in yellow sand in shrubland.

Flowering period. October-December.

Conservation status. 2RC. Occurs within Kalbarri National Park.

Verticordia dichroma A S. George var. **syntoma** A.S. George, var. nov.

Ab *Verticordia dichroma* var. *dichroma* foliis minoribus minus reflexis, turmis paucifloris et floribus minoribus, differt. Folia plerumque 2-3 mm longa. Sepala 4 mm longa. Petala 5-6 mm longa fimbriis ad 2 mm longis.

Typus: near N edge of Murchison House Stn, Western Australia, c. 27° 15' S, 114° 16' E, 29 October 1986, *A.S. George* 16846 & *E.A. George* (holo: PERTH; iso: AD, CANB, K, MEL, NSW, PERTH).

Differs from *V. dichroma* var. *dichroma* in the smaller, less reflexed leaves, and smaller groups of smaller flowers. Leaves usually 2-3 mm long. Sepals 4 mm long. Petals 5-6 mm long with fringe to 2 mm long.

Distribution and habitat. Occurs mainly in the northern part of this species' range, extending N to W of Billabong Roadhouse, Western Australia (Figure 37). Grows in yellow and red sand in shrubland.

Flowering period. October-November.

Conservation status. 2RC.

Etymology. From the Greek *syntomos* (shortened), in reference to the smaller groups of flowers and the slightly smaller leaves and flowers.

Verticordia endlicheriana Schauer, in J.G.C. Lehmann, Pl. Preiss. 1: 101 (1846). *Lectotype* (here chosen): Konkoberup Hills, near Cape Riche, Western Australia, November 18--, *L. Preiss* 181 (LD). *Other syntype*: near Gordon River, Hay District, Western Australia, November 18--, *L. Preiss* 179 (LD).

Verticordia hirta Turcz., Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 10: 327 (1852). *Lectotype* (here chosen); south-western Western Australia, 184-, *J. Drummond* 5: 112 (KW; isolecto: BM, Fl, K - 3 sheets, NSW, W).

Typification. The two syntype collections of *V. endlicheriana* represent the same taxon but are somewhat different in floral morphology. That selected as lectotype agrees more closely with

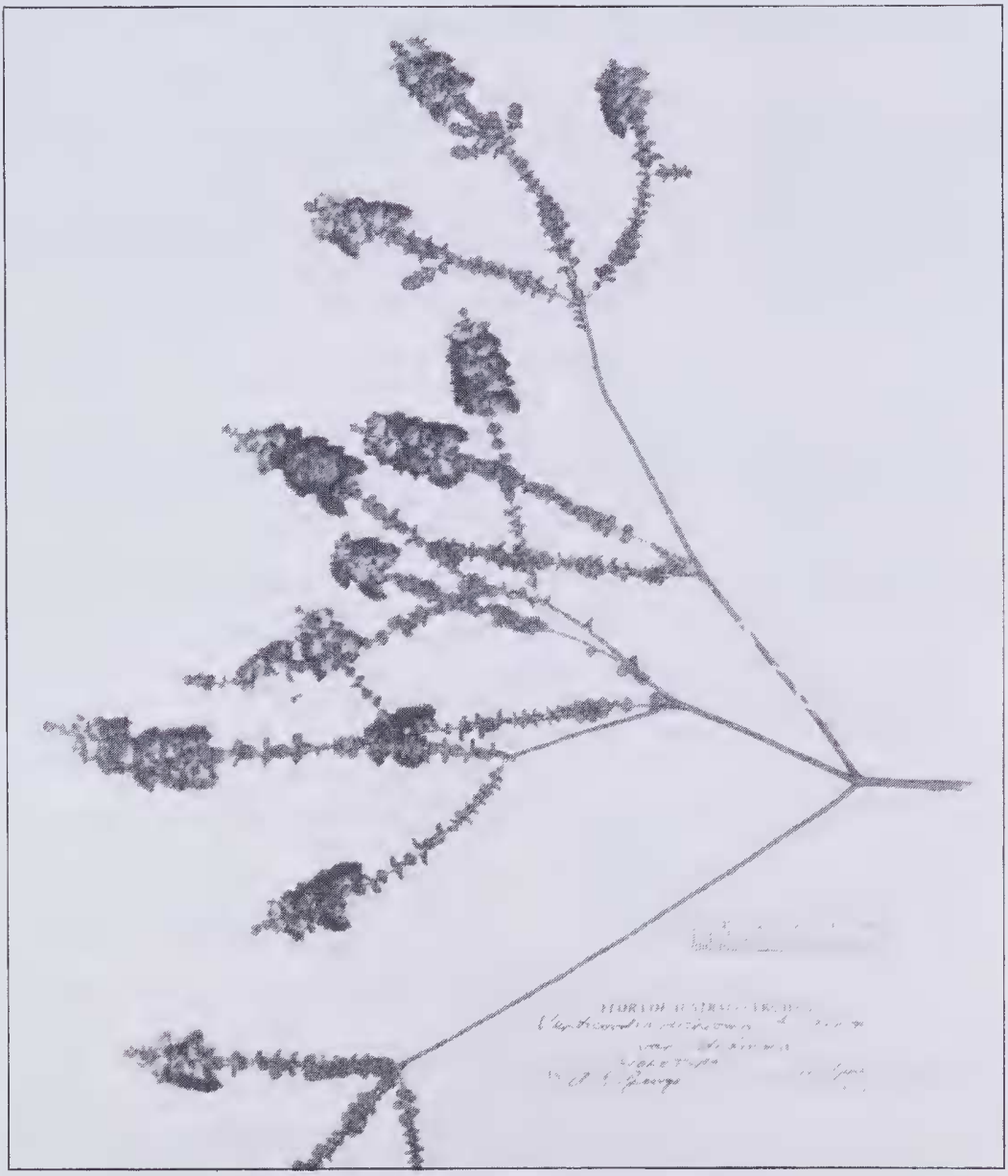

Figure 20. Holotype of *Verticordia dichroma* var. *dichroma*. Scale in cm.

Schauer's protologue as follows: petals 7-lobed (8- or 9-lobed in *Preiss* 179); staminodes tapering though not acuminate (obtuse in *Preiss* 179). *Preiss* 181 also has lower lateral branchlets with terete leaves, whereas *Preiss* 179 has only a single small branchlet with few leaves.

A lectotype is selected for *V. hirta* since the sheet at KW does not bear Turczaninow's annotation. It represents the same variety of the species as typical *V. endlicheriana*.

Verticordia endlicheriana is here restored as an accepted species. Lack of recognition of the species has been responsible for some of the problems of identification that have beset the *acerosa* - *chrysantha* group for many years, problems compounded by variation within the species themselves. *V. endlicheriana* is closely related to *V. acerosa* in having caducous bracteoles and a ribbed warty hypanthium but is distinguished from that species especially by its broader-based hypanthium and oblong obtuse entire staminodes. The species is widespread in inland south-western Western Australia from Mt Adams and Perenjori S to Mt Barker and E to Narembeen and the Hamersley River. There is considerable variation within the species, here recognised in five varieties.

Key to varieties

1a Petals 3.8-4.5 mm long, the lamina 1.3-1.5 mm long; sepals 3.5-4 mm long ..... var. *major* A.S. George

1b Petals 2.5-4 mm long, the lamina 0.4-1.3 mm long; sepals 3-3.5 mm long

2a Floral leaves linear, 4-8 mm long ..... var. *angustifolia* A.S. George

2b Floral leaves orbicular to ovate, 2-4 mm long

3a Hypanthium in flower 0.9-1.3 mm long; petal lamina 1-1.3 mm wide; stamens almost uniform, 1.2-2.2 mm long; flowers not scented, not turning red ..... var. *endlicheriana*

3b Hypanthium in flower 0.6-0.8 mm long; petal lamina 0.4-1 mm wide; stamens markedly alternately long and short; flowers scented, turning red

4a Petal lamina 0.8-1 mm wide; style 2.8-3 mm long; long stamens 2.6-3.2 mm long; shrub rounded, compact ..... var. *compacta* A.S. George

4b Petal lamina 0.4-0.7 mm wide; style 1.7-2.1 mm long; long stamens 1.6-2 mm long; shrub ± open ..... var. *manicula* A.S. George

Verticordia endlicheriana Schauer var. **endlicheriana**

Corymb-like or ± irregular shrub to 70 cm. Lower leaves linear, semiterete. Floral leaves orbicular to ovate. Hypanthium 0.9-1.3 mm long. Sepals 2.3-3 mm long. Petals 2.8-3.2 mm long, the lamina 0.9-1.2 mm wide. Stamens alternately long and short, the former 1.5-2.2 mm long, the latter 1.2-2 mm long. Style 1.5-2.5 mm long.

Distribution and habitat. Occurs from the Cranbrook-Tambellup area E to Jerramungup and S to the Porongurup area and Cape Riche (Figure 37). Grows in gravelly loam, granitic loam and clay-loam, in mallee heath and eucalypt low open woodland.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Verticordia endlicheriana Schauer var. **compacta** A.S. George, var. nov.

Varietas inter hinc *Verticordiam* var. *endlicherianam*, var. *angustifoliam* et var. *majorem*, illinc var. *maniculam*, intermedia. Frutex rotundatus compactus. Hypanthium 1-1.5 mm longum. Sepala 3-3.5 mm longa lamina 1-1.5 mm lata. Petala 2.5-4 mm longa, lamina 0.8-1 mm lata. Stamina longa 2.6-3.2 mm longa, brevia 1-2 mm longa. Stylus 2.8-3 mm longus.

Typus: S of Perenjori, Western Australia, 29° 43' S, 116° 26' E, 20 October 1984, *A.S. George* 16418 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Intermediate between, on the one hand var. *endlicheriana*, var. *angustifolia* and var. *major*, and on the other var. *manicula*. A rounded compact shrub. Hypanthium 1-1.5 mm long. Sepals 3-3.5 mm long, the lamina 1-1.5 mm wide. Petals 2.5-4 mm long, the lamina 0.8-1 mm wide. Long stamens 2.6-3.2 mm long, the short 1-2 mm. Style 2.8-3 mm long.

Distribution and habitat. Occurs from Latham S to Dowerin (Figure 40). Grows in sandy loam over laterite in heath and shrubland.

Flowering period. October-November.

Conservation status. 3V.

Etymology. The Latin epithet (*compactus*, compact, dense) refers to the habit of the mature plant.

Verticordia endlicheriana var. *compacta* is closely allied to var. *endlicheriana* but is more rounded and very compact in habit. The stamens are more markedly different in length.

Verticordia endlicheriana Schauer var. **manicula** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae endlicherianae* petalis minoribus (laminis 0.4-0.7 mm latis), staminibus longis brevioribus (1.8-2 mm longis), stylo 1.7-2.1 mm longo, et florescentia praecoci, differt.

Typus: WSW of Carnamah, Western Australia, 29° 48' S, 115° 43' E, 17 October 1984, *A.S. George* 16351 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Differs from all other varieties of *V. endlicheriana* in the smaller petals (lamina 0.4-0.7 mm wide), the long stamens only 1.8-2 mm long, the style 1.7-2.1 mm long, and the earlier flowering period.

Distribution and habitat. Occurs from the Burma Road near Strawberry S to Watheroo National Park and Gunyidi, with an outlier NW of Ballidu (Figure 39). Grows in gravel, gravelly sand and sandy loam, in heath.

Flowering period. September-October.

Conservation status: 3V.

Etymology. Named from the Latin *manus* (hand) with the diminutive suffix *-iculus*, in reference to the appearance of the petals.

Verticordia endlicheriana var. *manicula* has the smallest flowers of the varieties of this species. It also flowers earlier than the others, being almost over by the time var. *compacta* and southern varieties flower. At one locality E of Gunyidi, var. *manicula* and var. *compacta* are sympatric.

Verticordia endlicheriana Schauer var. **angustifolia** A.S. George, var. nov.

Ab varietatibus alis *Verticordiae endlicherianae* foliis floralibus longioribus angustioribus (4-8 mm longis, 0.5-1 mm latis), et ab var. *endlicheriana* floribus minoribus (sepalis 2-2.3 mm longis, petalis 2-2.5 mm longis), differt.

Type: Mount Barker, Western Australia, 34° 39' S, 117° 39' E, 6 December 1964, *A.S. George* 6457 (holo: PERTH).

Differs from all other varieties of *V. endlicheriana* in the longer, narrower floral leaves (4-8 mm long, 0.5-1 mm wide), and from var. *endlicheriana* - its nearest relative - in the smaller flowers (sepals 2-2.3 mm long, petals 2-2.5 mm long).

Distribution and habitat. Occurs on Mt Barker, growing in loam among granite rocks, in heath (Figure 40).

Flowering period. November-December.

Conservation status. 2V. Currently known from a single locality.

Etymology. From the Latin *angustus* (narrow) and *folium* (leaf), in reference to the floral leaves.

The collections from Mt Barker are quite consistent morphologically, but one from an unknown locality by *Baxter* (labelled King George Sound, BM) has larger flowers - sepals 3.5 mm long, petals 4.5 mm long.

Verticordia endlicheriana Schauer var. **major** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae endlicherianae* floribus majoribus (sepalis 3.5-4 mm longis, petalis 3.8-4.5 mm longis), differt.

Typus: Hamersley Drive, near N boundary of Fitzgerald River National Park, Western Australia, 24 October 1984, *A.S. George* 16485 & *E.A. Berndt* (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Differs from all other varieties of *V. endlicheriana* in the larger flowers (sepals 3.5-4 mm long, petals 3.8-4.5 mm long).

Distribution and habitat. Occurs from E of Pingrup S to the Green Range and E to the Hamersley River, Western Australia (Figure 39). Grows in gravelly loam and granitic loam, in mallee heath.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *major* (larger), the variety having larger flowers than those of the other varieties.

The flowers of *Verticordia endlicheriana* var. *major* are larger than those of the other four varieties. South of Jerramungup the distributions of this variety and var. *endlicheriana* overlap.

Verticordia eriocephala A.S. George, sp. nov.

Ad *Verticordiam brownii* (Desf.) DC. affinis, a qua floribus albis vel cremeis, hypanthii dimidio inferiore quam superiore majore et pilis basalibus longioribus, staminibus et staminodiis gracilioribus, et stylo breviore (3.5-4.5 mm longo) graciliore glabra, differt.

Typus: Tomkins Road, S of Mt Adams Road, N of Eneabba, Western Australia, 29° 26' S, 115° 11' E, 30 October 1985, *A.S. George* 16562 & *E.A. George* (holo: PERTH; iso: CANB).

Closely related to *V. brownii*, from which it differs in the white or cream flowers, the lower part of the hypanthium larger than the upper and with longer basal hairs, the stamens and staminodes more slender, and the shorter (3.5-4.5 mm long), more slender, glabrous style.

Distribution and habitat. Widespread in south-western Western Australia from the Mt Adams area S to Moora, through Wongan Hills to Borden, and E to Boorabbin and Salmon Gums; also recorded near Mt Ragged and Point Culver (Figure 36). Grows in sandy loam in heath, occasionally in low open woodland.

Flowering period. Late October-December.

Conservation status. Not rare or endangered.

Etymology. From the Greek *erion* (wool) and *cephala* (head), in reference to the compact massing of flowers over the top of the plant.

This taxon has long been included within *Verticordia brownii*, but that name is now restricted to the pink-flowered plant that occurs near the south coast from S of Ravensthorpe to Mt Ragged. *Verticordia eriocephala* differs in having cream or white flowers, the hypanthium wider in the lower half, the stamens and staminodes more slender, and the style glabrous. Mature plants are usually larger than those of *V. brownii*. East of Salmon Gums the records are scattered; at one locality SE of Mt Ragged the species has been recorded with *V. brownii*.

Verticordia etheliana C. Gardner, J. Roy. Soc. Western Australia 27: 190 (1943). *Lectotype* (here chosen): between Yaringa and Northampton, Western Australia, 15 September 1940, *W.E. Blackall* 4714 (PERTH; isolecto: PERTH - 4 sheets).

Typification. The five type sheets at PERTH are of the same collection but there is some confusion in the label data, hence a lectotype is selected. This is a sheet with both a label in Gardner's hand and a typed label; it also bears pencil sketches of floral details by Gardner. A second sheet has similar labels. A third has three small specimens annotated by Gardner but without full collection data; the date with one specimen is wrongly cited as 1938. The fourth sheet has a label in Blackall's hand. In the protologue the collector's number was wrongly given as 4724. According to Blackall's collecting book at PERTH, the type locality is 30 miles (c. 48 km) N of Galena on the Carnarvon road (now North-West Coastal Highway). The fifth sheet is from Gardner's private herbarium which was willed to the Benedictine Community in New Norcia and, in June 1970, transferred to the Western Australian Herbarium. This bears a small specimen plus fragments in a packet. It is annotated in Gardner's hand, with the correct locality and collector's number but the wrong date of collection. Although this sheet is annotated "Typus" by Gardner, it is not selected as lectotype since he stated in the paper of 1943 that Blackall had donated to the [then] State Herbarium the "specimens which form the type material of many of the species herein described".

Verticordia etheliana can be divided into two varieties on the basis of leaf and flower size. Most northern populations represent var. *etheliana*, but there is geographical overlap with the smaller variety which extends SSE towards Mullewa.

Key to varieties

Leaves 3-5 mm long; peduncles 6-10 mm long;
sepals 9-10 mm long; petals 6-10 mm long; style 16-20 mm long ..... var. *etheliana*

Leaves 2-3 mm long; peduncles 3-5 mm long;
sepals 7-8 mm long; petals 6-7 mm long; style 12-15 mm long ..... var. *formosa* A.S. George

Verticordia etheliana C. Gardner var. **etheliana**

Openly branched shrub to 1.5 m. Leaves orbicular, 3-5 mm long. Flowers in small groups below branchlet apices, mostly opening concurrently. Peduncles 6-10 mm long. Sepals 9-10 mm long, red. Petals 6-10 mm long, pink grading to cream at base but all reddening with age. Style 16-20 mm long.

Distribution and habitat. Occurs in the eastern part of Kalbarri National Park, Western Australia (Figure 35). Grows in yellow and yellow-brown sand in tall shrubland.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Verticordia etheliana var. **formosa** A.S. George, var. nov.

Ab *Verticordia etheliana* C. Gardner var. *etheliana* habitu compactiore, foliis, pedunculis, petalis et stylo brevioribus, differt. Folia 2-3 mm longa. Pedunculi 3-5 mm longi. Sepala 7-8 mm longa. Petala 6-7 mm longa. Stylus 12-15 mm longus.

Typus: E of Yuna, Western Australia, c. 28° 15' S, 115° 16' E, 19 October 1984, *A.S. George* 16403 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Differs from var. *etheliana* in the more compact habit, and the smaller leaves, peduncles, petals and style. Leaves 2-3 mm long. Peduncles 3-5 mm long. Sepals 7-8 mm long. Petals 6-7 mm long. Style 12-15 mm long.

Distribution and habitat. Extends from the eastern part of Kalbarri National Park (N of the Murchison River) SE to Yuna and almost to Mullewa (Figure 35). Grows in yellow and reddish sand in tall shrubland.

Flowering period. September-November.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *formosus* (well formed, handsome) in reference to the more compact, showy habit.

Verticordia fastigiata Turcz., Bull. Cl. Phys.-Math. Acad. Saint-Pétersbourg 10: 327 (1852).

Verticordia conferta Benth., Fl. Austral. 3: 22 (1867). *Lectotype* (here chosen); south-western Western Australia, 184-, *J. Drummond* 5: 114 (K; isolecto: BM, CGE, FI, K, KW, W). *Other syntype*: swampy places near East Mt Barren, no date, *G. Maxwell* s.n. (K).

Typification. The lectotype sheet was annotated by Bentham as *V. conferta*, while the syntype was labelled by him "V. conferta Benth. var.", indicating that he considered the latter atypical. *Drummond* 5: 114 is also the type of *V. fastigiata* Turcz. of which name the specimen at KW is the holotype.

Verticordia fimbrilepis Turcz., Bull. Soc. Imp. Nat. Moscou 20: 158 (1847). *Type*: south-western Western Australia, 184-, *J. Drummond* 3: 24 (holo: KW; iso: BM, CGE, K - 3 sheets, MEL, NSW, W). The sheet at MEL is unnumbered but matches the other specimens. Drummond collected the species only once.

This species, one of the rarest in the genus and for more than a century known only from the type, was re-discovered in 1983 by Mr Norm Stevens, of Ongerup, Western Australia. In the same year a new subspecies was discovered on the Kent River by Mr Tony Annels, Manjimup. It differs from the typical subspecies in the length of the peduncles and in the petals and staminodes.

Key to subspecies

Peduncles 2-4 mm long; petal lamina 1.3-1.5 mm wide;
staminodes with a long apical cilium ..... subsp. *fimbrilepis*

Peduncles 5-15 mm long; petal lamina 0.9-1 mm wide;
staminode fringe of ± equal segments ..... subsp. *australis* A.S. George

Verticordia fimbrilepis Turcz. subsp. **fimbrilepis**

Peduncles 2-4 mm long. Petal lamina 1.3-1.5 mm wide, fimbriate. Staminodes fimbriate across broad apex, one cilium much longer than the others.

Distribution and habitat. Occurs W of Woodanilling, Western Australia (Figure 33). Grows in sandy loam over gravel in heath.

Flowering period. November-December.

Conservation status. 2E. Three small populations are known, all on road verges.

Verticordia fimbrilepis subsp. **australis** A.S. George, subsp. nov.

Ab subspecie typica pedunculis 5-15 mm longis, lamina petalorum 0.9-1 mm lata laciniata, et staminodiis per apicem et margines laterales superos fimbriatis sed sine cilia apicali longa, differt.

Typus: Break [forestry] Road crossing, Kent River, Western Australia, c. 34° 50' S, 117° 03' E, 5 November 1985, *A.S. George* 16579 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL).

Differs from the type subspecies in the long peduncles 5-15 mm long, the laciniate petals 0.9-1 mm wide, and the staminodes fimbriate across the apex and lateral margins but without a long apical cilium.

Distribution and habitat. Known from two localities, one on the Kent River NW of Denmark, the other on Mt Willyung N of Albany (a single young plant recorded) (Figure 33). Grows in granitic soil in low open heath.

Flowering period. Late October-November.

Conservation status. 2RC. The type locality is within State forest.

Etymology. The Latin *australis* (southern) refers to the geographical distribution relative to that of *Verticordia fimbrilepis* subsp. *fimbrilepis.*

The longer peduncles give the flowering branchlets a more open aspect than that of *Verticordia fimbrilepis* subsp. *fimbrilepis.* In addition the petals are narrower and more deeply and coarsely fringed, while the staminodes are fringed on the upper lateral margins as well as across the apex but lack the long terminal cilium of subsp. *fimbrilepis.* The subspecies may occur on other granitic hills in the area.

Verticordia fragrans A.S. George, sp. nov.

Ab speciebus aliis *Verticordiae* sect. *Pennuligerae* floribus pallide roseis et albis fragrantibus, lobis sepalorum latibus, et petalis prominentibus supra integris, praecipue differt. Frutex ad 2.5 m altus, laxe ramosus. Folia elliptica ad obovata, 1.5-4 mm longa, semiamplexicaulia. Pedunculi 1.5-3 mm longi, incrassati. Hypanthium 3 mm longum, verrucosum, glabrum; appendicula lata, crassa. Sepala 3.5-4 mm longa, lobis 6-9 plumosis, auriculis orbicularibus fimbriatis. Petala orbicularia auriculis ciliatis, 4-4.5 mm longa, erecta, integra, ad basin ciliata, cum androecio unita. Stamina 3.5 mm longa; staminodia oblonga, acuta, incurva, 3 mm longa, glandulosa. Stylus 5 mm longus, infra apicem curvatus, barbatus. Ovuli 10.

Typus: S of Eneabba, Western Australia, 29° 54' S, 115° 15' E, 17 October 1984, *A.S. George* 16361 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL). Figure 21.

Differs from the other species of *Verticordia* sect. *Pennuligera* in the pale pink and white fragrant flowers, the broad lobes of the sepals, and the prominent petals entire along the upper margins. A shrub to 2.5 m tall, openly branched. Leaves elliptic to obovate, 1.5-4 mm long, semiamplexicaul. Peduncles 1.5-3 mm long, thickened. Hypanthium 3 mm long, verrucose, glabrous; appendages broad, thick. Sepals 3.5-4 mm long, with 6-9 plumose lobes, the auricles orbicular, fimbriate. Petals orbicular with ciliate auricles, 4-4.5 mm long, erect, entire but towards base ciliate, united with androecium. Stamens 3.5 mm long; staminodes oblong, acute, incurved, 3 mm long, glandular. Style 5 mm long, curved below apex, bearded. Ovules 10.

Distribution and habitat. Restricted to a small area near Eneabba, south-western Western Australia (Figure 36). Grows in deep white sand with tall shrubland, occasionally with low open woodland of *Eucalyptus todtiana.*

Flowering period. October-November.

Conservation status. 2V.

Etymology. The Latin *fragrans* refers to the scented flowers.

A distinctive species especially in the prominent, mostly entire petals and the broad sepal lobes.

Figure 21. Holotype of *Verticordia fragrans*. Scale in cm.

Verticordia galeata A.S. George, sp. nov.

Ad *Verticordiam chrysantham* Endl. affinis, a qua pedunculis longioribus (12-20 mm longis), antherae appendicula majore galeiforme inflata (0.5-0.8 mm longa), et staminodiis anguste triangularibus acutis, differt.

Typus: The Loop, Murchison River, Kalbarri National Park, Western Australia, 27° 34' S, 114° 27' E, 18 October 1984, *A.S. George* 16389 & *R. Wemm* (holo: PERTH); same locality, collectors and number (syn: CANB, K).

Closely related to *V. chrysantha*, from which it differs in the longer peduncles (12-20 mm long), the larger hooded inflated anther appendage (0.5-0.8 mm long), and the narrowly triangular staminodes.

Distribution and habitat. Recorded only from the Murchison River gorge at The Loop, Kalbarri National Park (Figure 34). Grows in red sand among sandstone rocks, in open shrubland.

Flowering period. October.

Conservation status. 2RC.

Etymology. From the Latin *galeatus* (hooded), in reference to the large cucullate appendage of the anther.

The species is closely related to *V. chrysantha* but is easily distinguished by the large inflated appendage of the anther. The peduncles are long and slender, and the leaves also are longer than those of most collections of *V. chrysantha*. The acute staminodes are a further difference, those of *V. chrysantha* typically being obtuse and slightly lobed.

Verticordia gracilis A.S. George, sp. nov.

Ad *Verticordiam pritzelii* Diels affinis, a qua ramis et pedunculis gracilioribus; hypanthio pilosiore; sepalis brevioribus, plus divisis sed lobis reflexis nullis; petalis orbicularibus eroso-dentatis; antheris compressis; et ovario magis profunde inserto, praecipue differt.

Typus: N of Mt Holland Western Australia, c. 32° 05' S, 119° 40' E, 8 November 1984, *M. Smith* 130 (holo: PERTH; iso: CANB, K). Figure 22.

A distinctive species, probably related to *V. pritzelii*, but differing in the more slender branchlets and peduncles, the more pilose hypanthium, the shorter more divided sepals but lacking auricles, the orbicular erose-dentate petals. the compressed anthers, and the deeply inserted ovary.

Distribution and habitat. Occurs between Bruce Rock and Hyden and east to the Mt Holland area (Figure 32). Grows in yellow sand and gravelly sand in heath.

Figure 22. Holotype of *Verticordia gracilis*. Scale in cm.

Flowering period. Late October-November.

Conservation status. 2R.

Etymology. The Latin *gracilis* (slender) refers to the slender stems and peduncles.

The species is related to *Verticordia pritzelii*, having a similar habit, leaves and style. It is more slender, however, and is easily distinguished by the lack of reflexed lobes to the sepals. The sepals are more finely divided, and the petals are shortly dentate to erose. Although the androecium is similar, the anthers of *V. gracilis* differ in being vertically compressed. The flowers are cerise, fading to pink. The species is considered distinct enough to warrant a new section (see above).

Verticordia grandis J.L. Drumm., Hooker's J. Bot. Kew Gard. Misc. 5: 119 (1853)

Lectotypе (here chosen) : south-western Western Australia, 1849-50, *J. Drummond* 6: 44, (K; isolecto: BM, CGE - 2 sheets, E, K - 2 sheets, W).

Typification. There is no specimen annotated by Drummond who described the species in a letter to W. Hooker. He made only one collection, the specimens of which mostly have long stems with many flowers, as described by him. Because there is some variation, especially in leaf size, a lectotype is chosen, being the specimen with Drummond's number tag 44 attached, on the sheet at K presented by W.W. Saunders.

Verticordia habrantha Schauer, in J.G.C. Lehmann, Pl. Preiss. 1: 100 (1844). *Type*: near Gordon River, Hay District, Western Australia, November 18--, *L. Preiss* 169 (holo: LD; iso: MEL).

Verticordia umbellata Turcz., Bull. Soc. Imp. Naturalistes Moscou 20, 1: 159 (1847). *Lectotype* (here chosen): south-western Western Australia, 184-, *J. Drummond* 3: 25 (KW; isolecto: BM, CGE, FI, K - 3 sheets, MEL, NY, W).

Typification. A lectotype is selected for *V. umbellata* since the sheet at KW, although probably seen by Turczaninow, is not annotated by him.

Verticordia habrantha is variable but further study is needed to determine if it should be formally divided. Some plants have a small lignotuber, several erect stems, and flowers with petals up to 5 mm long. Others have no lignotuber, a single basal stem, widely but openly branched above, and flowers with petals down to 2.8 mm long. In flower size there is a range from one extreme to the other.

Verticordia halophila A.S. George, sp. nov.

Ad *Verticordiam pennigeram* Endl. arcte affinis, a qua habitu erecto magis ramoso, foliis crassis, pedunculis brevioribus, petalis minus connatis, staminodiis brevioribus, stylo longioribus et ovulis minus numerosis, differt; etiam ad V. *lindleyi* Schauer affinis, a qua foliis crassis, pedunculis brevioribus, petalis grosse fimbriatis, staminis staminodiis que longioribus, stylo longiore, et ovulis minus numerosis, differt. Pedunculi 0.5-1 mm longi. Sepala 4-5 mm longa. Petala 3.5-4 mm longa,

breviter et grosse fimbriata. Stamina 1.5-1.6 mm longa; staminodia 1.4-1.5 mm longa. Stylus 5-5.6 mm longus. Ovuli 6.

Typus: S of Coorow, Midlands Hwy, Western Australia, 29° 58'S, 116° 05'E, 31 October 1985, *A.S. George* 16570 & *E.A. George* (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Closely related to *Verticordia pennigera* Endl., from which it differs in the erect, more bushy habit, the thick leaves, shorter peduncles, less connate petals, shorter staminodes, longer style and fewer ovules; also related to *V. lindleyi* Schauer, from which it differs in the thick leaves, shorter peduncles, coarsely fimbriate petals, longer stamens and staminodes, longer style and fewer ovules. Peduncles 0.5-1 mm long. Sepals 4-5 mm long. Petals 3.5-4 mm long, shortly and coarsely fimbriate. Stamens 1.5-1.6 mm long; staminodes 1.4-1.5 mm long. Style 5-5.6 mm long. Ovules 6.

Distribution and habitat. Occurs in the Coorow area (Figure 37). Grows on subsaline flats in open woodland and shrubland.

Flowering period. Mid-October-November.

Conservation status. 2E. Only two populations are known, both of which could be threatened by clearing or an increase in soil salinity.

Etymology. Named from the Greek *hals* (salt) and *-philus* (loving), in reference to the habitat which is unusual in the genus.

Plants of this species have a twiggy habit and a distinct red tinge to the leaves. The flowers are mostly pale pink with the sepals grading to dark red on the lamina. The species was discovered by the late Charles Chapman.

Verticordia harveyi Benth., Fl. Austral. 3: 22 (1867). *Lectotype* (here chosen): near Cape Riche, Western Australia, March 1854, *W.H. Harvey* s.n. (K) (Figure 23). *Other syntype*: ?same locality, 18--, *G. Maxwell* s.n. (BM).

Typification. The lectotype sheet (Figure 23) is annotated in Bentham's hand and the collector is commemorated in the specific epithet. Only two collections (besides the types) had been made of this species, one in the 1950s near Manypeaks (S.P. Pfeiffer, PERTH), the other without locality or collector (NSW), until its rediscovery in March 1991 by Mr Norm Stevens.

Verticordia helichrysantha F. Muell. ex Benth., Fl. Austral. 3: 21 (1867). *Lectotype* (here chosen): Phillips Range, Western Australia, 18--, *G. Maxwell* s.n. (MEL; isolecto: K, MEL). *Other syntype*: Cape Riche and South West Bay, Western Australia, 18--, *G. Maxwell* s.n. (K, MEL).

Typification. The specimen selected as lectotype is accompanied by Mueller's epithet in his hand ("inedit"), and fits the protologue better than the syntype in having larger flowers (10 mm wide) agreeing with the protologue ("nearly 1/2 in. diameter"). It also bears a dissected flower which may have been examined by Bentham. The syntype has flowers 8-9 mm diam.

Figure 23. Lectotype of *Verticordia harveyi* Benth. (K). Scale in cm.

Verticordia helmsii S. Moore, J. Linn. Soc. Bot 34: 190 (1899). *Lectotype* (here chosen): Gnarlbine Western Australia, November 1895, S. Moore s.n. (BM; isolecto: K). *Other syntype*: Warangering [near Red Kangaroo Hill], Western Australia, 14 November 1891, *R. Helms* s.n. (AD - 4 sheets, MEL, NSW).

Verticordia adenocalyx Diels, Bot. Jahrb. 35: 404 (1904).

Type: near Karalee, Western Australia, November 1901, *L. Diels* 5566; not found. *Neotype* (here nominated): between Yellowdine and Bronti, Western Australia, Jan. 1927, *C.A. Gardner* 164 (PERTH).

Typification. A lectotype is chosen for *V. helmsii* because both sheets seen have labels in Moore's hand. Although he described the style as glabrous his specimens do have the short beard below the stigma that is typical of the species.

No specimen of Diels' collection has been found in material of *Verticordia* in some 20 herbaria including the Botanisches Museum Berlin-Dahlem (B). The type is therefore presumed lost and a neotype from the same area nominated.

Verticordia huegelii Endl., Enum. 46 (1837)

Verticordia huegelii is a variable species. Four varieties are here recognised, one under the epithet *stylosa* first published at specific rank by Turczaninow. This subdivision is based on variations in the form of the staminodes, flower colour, habit and to some extent size.

Key to varieties

1a Staminodes linear-subulate with 1 (rarely 2) teeth each side ..... var. *tridens* A.S. George

1b Staminodes ovate-lanceolate, acuminate, fringed

2a Flowers cream or pale yellow with white petals at anthesis

3a Plant erect ..... var. *huegelii*

3b Plant decumbent ..... var. *decumbens* A.S. George

2b Flowers yellow at anthesis ..... var. *stylosa* (Turcz.) A.S. George

Verticordia huegelii Endl. var. **huegelii**

Typical *Verticordia huegelii* has creamy white flowers that turn maroon with age. The staminodes are usually ovate and finely fringed, but sometimes are narrower with a few slender teeth each side. The hairs of the style are usually white and the stigma is golden yellow, but in populations in the Mt Lesueur area the hairs and stigma are reddish purple.

Distribution and habitat. Frequent from Mingenew S to Dwellingup and at scattered localities farther inland, including one from NE of Ravensthorpe. Grows in clay and clay-loam, often with laterite or granite, in open heath.

Flowering period. September - October.

Conservation status. Not rare.

Verticordia huegelii var. **stylosa** (Turcz.) A.S. George, stat. et comb. nov. - *Verticordia stylosa* Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 160 (1847). *Lectotype* (here chosen): south-western Western Australia, *J. Gilbert* 327 (KW).

Typification. The type sheet at KW is not annotated by Turczaninow but the single specimen - a whole young plant - agrees with the protologue. The staminodes are typically ovate but vary to lanceolate, e.g. Darkin Swamp, 12 November 1981, *A. Selkirk* s.n. (PERTH); 7 km S of Pingelly, 4 November 1983, *M. Hamilton* s.n. (PERTH).

Similar to var. *huegelii* but has yellow flowers and tends to flower later.

Distribution and habitat. Occurs in scattered localities from Wongan Hills S to Kojonup (Figure 41). Grows in clay-loam and sandy loam, sometimes rocky, in low heath and open woodland.

Flowering period. October - November.

Conservation status. Not rare.

Verticordia huegelii Endl. var. **decumbens** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae huegelii* caudice ignis tolerabili, habitu graciliore, ramulis decumbentibus, et floribus parce minoribus, differt. Frutex ad 10 cm altus et 30 cm latus. Folia 3-6 mm longa, 0.4-0.6 mm crassa. Hypanthium 2-2.2 mm longa. Sepala 7-8 mm longa; lamina 1 mm longa, 1.5 mm lata. Petalorum lamina 1.7-1.8 mm longa, 1.6-1.9 mm lata. Stylus 5 mm longus.

Typus: E of Kelmscott, Brookton Highway, Western Australia, c. 32° 11' S, 116° 15' E, 18 November 1985, *D.B. Foreman* 1057 (holo: PERTH; iso: AD, CANB, MEL).

Differs from the other varieties of *V. huegelii* in the fire-tolerant rootstock, the more slender habit, the decumbent branchlets and the slightly smaller flowers. A shrub to 10 cm high and 30 cm wide. Leaves 3-6 mm long, 0.4-0.6 mm thick. Hypanthium 2-2.2 mm long. Sepals 7-8 mm long; lamina 1 mm long, 1.5 mm wide. Petal lamina 1.7-1.8 mm long, 1.6-1.9 mm wide. Style 5 mm long.

Distribution and habitat. Recorded from several granitic outcrops from Mundaring to Mt Saddleback on the Darling Plateau E of Perth, Western Australia (Figure 34). Grows in open shrubland.

Flowering period. Late October-November.

Conservation status. 2?E. Known from few populations at well-frequented localities, but possibly occurs on a number of granitic outcrops in State forest areas.

Etymology. The Latin *decumbens* refers to the branches.

In floral morphology this is similar to *Verticordia huegelii* var. *huegelii* but is slightly smaller. The typical variety is, however, an erect or spreading shrub to 40 cm tall and is killed by fire. It also flowers earlier, being almost finished by the time var. *decumbens* is in full flower. The style hairs are ascending, not spreading. A collection from the Coorow-Green Head Road E of the Brand Highway is probably this taxon.

Verticordia huegelii Endl. var. **tridens** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae huegelii* Endl. staminodiis plerumque tridentatis differt. Flores citrini, rubescentes. Staminodia subulata sed utrinque 1-(raro 2-) dentata.

Typus: W of Kamballup, Western Australia, 34° 32' S, 117° 55' E, 26 October 1984, *A.S. George* 16515 & *E. Berndt* (holo: PERTH; iso: CANB, K).

Differs from the other varieties of *V. huegelii* in having usually tridentate staminodes. Flowers lemon-yellow turning red. Staminodes subulate but with 1 (rarely 2) teeth on each margin.

Distribution and habitat. Occurs from the Wongan Hills district S almost to the Porongurup Range, Western Australia (Figure 34). Grows in gravelly loam and sandy loam, in *Eucalyptus wandoo* and *E. occidentalis* low open woodland and shrubland.

Flowering period. October-November.

Conservation status. 2E. Four small populations are known, all on road verges.

Etymology. From the Latin *tri-* (three) and *dens* (tooth), in reference to the staminodes.

Superficially, this taxon resembles *Verticordia huegelii* var. *stylosa* in having initially yellow flowers that turn red. The 3-lobed staminodes easily distinguish it from that variety. Occasionally the staminodes are 4- or 5-lobed. The anthers are smaller than those of var. *stylosa* and var. *huegelii*. In one collection from near Wongan Hills the hairs of the style are purple.

Verticordia inclusa A.S. George, sp. nov.

Ad *Verticordiam insignem* Endl. affinis, a qua foliis et floribus plerumque minoribus, staminibus inclusis, staminodiis tantum in marginibus fimbriatis, et stylo brevi, differt. Folia floralia 1.5-3 mm longa; sepala 4-5 mm longa; petala 3-4 mm longa; stamina 0.6-0.7 mm longa; stylus 0.2-0.3 mm longa.

Typus: N of turnoff to East Mt Barren, on Hopetoun - Ravensthorpe road, Western Australia, 24 October 1984, *A.S. George* 16479 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL, NSW).

Closely related to *V. insignis* from which it differs in the usually smaller leaves and flowers, the included stamens, the staminodes fimbriate only on the margins, and the short style. Floral leaves 1.5-3 mm long. Sepals 4-5 mm long. Petals 3-4 mm long. Stamens 0.6-0.7 mm long. Style 0.2-0.3 mm long.

Distribution and habitat. Occurs between Fitzgerald and Esperance and inland to Boorabbin National Park, Western Australia (Figure 41). Grows in sandy loam and sand, sometimes over laterite, in heath and open mallee heath.

Flowering period. August-November.

Conservation status. Not rare or endangered.

Etymology. From the Latin *inclusus* (included), in reference to the stamens and style.

Closely related to *V. insignis*, this species may be distinguished especially by the short included stamens and style. Usually the leaves and flowers are smaller than those of *V. insignis*; some northern collections (e.g. 51 km SE of Moorine Rock, 22 October 1984, *A.S. George* 16449, PERTH) have flowers approaching those of *V. insignis* in size.

This species was figured as *V. roei* by W. Botting Hemsley, Icon. Pl. 28: t. 2779 (1905).

Verticordia insignis Endl., Enum. Pl. 47 (1837). *Holotype*: Swan River, Western Australia, November-December 1833, *K. von Huegel* (W; iso: BM).

The holotype bears the number 9, but this appears not to be the collector's number. There is also a dissected flower (late bud stage) and drawings.

Verticordia insignis comprises 3 subspecies, distinguished by flower size and colour.

Key to subspecies

1a Sepals 7-9 mm long; petals 3.5-5 mm long; stamens 5-6 mm long; anthers 0.7-0.8 mm long; style 6-7 mm long ..... subsp. *eomagis* A.S. George

1b Sepals 5-6 mm long; petals 3-4 mm long; stamens 2-4 mm long; anthers 0.2-0.4 mm long; style 2.5-6 mm long

2a Stamens 3.5-4 mm long; style 5-6 mm long; upper leaves mostly 4-9 mm long; sepals usually white ..... subsp. *insignis*

2b Stamens 2-3.5 mm long; style 2.5-3.5 mm long; upper leaves mostly 1.5-3 mm long; sepals pink ..... subsp. *compta* (Endl.) A.S. George

Verticordia insignis Endl. subsp. **insignis**

Shrub to 70 cm, the main stems ascending or widely spreading. Leaves linear, triquetrous, obtuse; upper leaves 3-9 mm long. Peduncles usually 12-25 mm long. Sepals 5-6 mm long, deeply fimbriate, with basal reflexed lobes having upturned densely fimbriate apices that form a comose ring about the hypanthium. Petals 3-4 mm long, the fringe 0.5-1 mm long. Stamens 3.5-4 mm long; anthers 0.2-0.4 mm long; staminodes 2-3 mm long, fringed. Style 5-6 mm long.

Distribution and habitat. Occurs along the Darling Scarp E of Perth, extending inland towards Northam and Brookton, Western Australia (Figure 42). Grows in gravelly and granitic soil, in open woodland.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Verticordia insignis Endl. subsp. **eomagis** A.S. George, subsp. nov.

Ab *Verticordia insigni* subsp. *insigni* et subsp. *compta* floribus majoribus differt. Sepala 7-9 mm longa. Petala 3.5-5 mm longa, fimbria 1-1.5 mm longa. Stamina 5-6 mm longa antheris 0.7-0.8 mm longis. Staminodia 4-4.5 mm longa, 0.8-1 mm lata. Stylus 6-7 mm longus.

Typus: near Doodenoo Creek, SSE of Badgingarra, Western Australia, c. 30° 31' S, 115° 34' E, 31 October 1986, *A.S. George* 16871 & *E.A. George* (holo: PERTH; iso: CANB).

Differs from the other subspecies of *V. insignis* in the larger flowers. Sepals 7-9 mm long. Petals 3.5-5 mm long, with fimbriae 1-1.5 mm long. Stamens 5-6 mm long with anthers 0.7-0.8 mm long. Staminodes 4-4.5 mm long, 0.8-1 mm wide. Style 6-7 mm long.

Distribution and habitat. Occurs from an area between Eneabba and Coorow S to the Badgingarra area, Western Australia, with one collection "north of New Norcia" (Figure 42). Grows in sand over laterite, occasionally on lateritic rises, in heath.

Flowering period. September-early November.

Conservation status. 2R.

Etymology. From the Latin *eo magis* (so much the more), in reference to both the larger size and the very attractive appearance of the flowers.

The northern populations of *Verticordia insignis*, here named subsp. *eomagis*, have consistently larger flowers than those of both typical *Verticordia insignis* and subsp. *compta*. Further, the petals are much more concave, and the staminodes are usually pale, in contrast to the red staminodes of the other two subspecies. The hairs on the inner face of the staminodes are very long, almost reaching the style.

Verticordia insignis subsp. **compta** (Endl.) A.S. George, comb. et stat. nov. - *Verticordia compta* Endl., Stirp. Herb. Huegel 3: 6 [1838] 1839. *Holotype*: E of 'New York' [presumably York], Western Australia, 183-, *J.S. Roe* s.n. (W; iso: BM).

Typification. The holotype bears a label "N.H.A.O. (Roe 2)", i.e. Nova Hollandia Australis Occidentalis, and the number 10, but this is not the collector's number.

Erect or straggly shrub to 1 m tall. Upper leaves 1.5-4 mm long. Peduncles usually 8-15 mm long. Sepals 5-6.5 mm long. Petals 3.5-4 mm long, the fringe up to 1.4 mm long. Stamens 2-3.5 mm long; anthers 0.2-0.4 mm long. Staminodes 2-3 mm long, 0.4-0.8 mm wide. Style 2.5-3.5 mm long.

Distribution and habitat. Occurs from Manmanning S to Ongerup and E to Kulin and Newdegate, Western Australia (Figure 42). Grows in sand in open woodland and heath.

Flowering period. October-November.

Conservation status. Not rare or endangered.

This taxon clearly belongs with *Verticordia insignis*. It is similar in size to typical *insignis* but has smaller upper leaves, shorter stamens and style, and the sepals as well as the petals are bright pink.

Verticordia integra A.S. George, sp. nov.

Ab *Verticordia serrata* (Lindley) Schauer foliis oblongis ad obovatis crassis integris, hypanthio minus verrucoso, et petalis majoribus orbicularibus (3-3.5 mm diam.) integris, praecipue differt.

Typus: S of Lake Grace - Newdegate road along Burngup South Road, Western Australia, 33° 08' S, 118° 48' E, 7 November 1985, *A.S. George* 16601 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL, NSW, PERTH).

Closely related to *V. serrata*, from which it differs especially in the oblong to obovate thick entire leaves, the less verrucose hypanthium, and the larger, orbicular entire petals (3-3.5 mm diam.).

Distribution and habitat. Occurs in the Newdegate area, with one record E of Ravensthorpe, Western Australia (Figure 35). Grows in sand over laterite, in mallee heath.

Flowering period. Late October-November.

Conservation status. 2R.

Etymology. From the Latin *integer* (whole, entire), in reference to the leaves and petals.

Although closely related to *V. serrata*, this taxon is easily distinguished by its entire leaves and large entire petals. It is relatively consistent morphologically. The flowers have a typical *Verticordia* scent.

Verticordia interioris C. Gardner ex A.S. George, sp. nov.

Ad *Verticordiam pictam* Endl. affinis, a qua petalis unguiculatis, staminibus 10 fertilibus et foliis verrucosis praecipue differt. Frutex diffusus ad 70 cm altus. Folia linearia, semiteretia, cuspidata, 3-7 mm longa. Pedunculi 4-8 mm longi. Hypanthium hemisphaericum, glabrum, 1.5-2 mm longum. Sepala 4-5 mm longa, 5-lobata lobis profunde fimbriatis. Petala cum androecio unita, elliptica, integra, 5-7 mm longa. Stamina 2-3 mm longa, filamentis latis, antheris clavatis connectivo globoso; staminodia teretia, obtusa, glandulosa. Stylus 3-4 mm longus, infra stigmatem pilis furcatis barbatus. Ovuli 8 vel 9.

Typus: Mt Leonora, Western Australia, 26 August 1968, *P.G. Wilson* 7238 (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Related to *V picta*, from which it differs especially in the clawed petals, the 10 fertile stamens, and the verrucose leaves. A shrub to 70 cm tall. Leaves linear, semiterete, cuspidate, 3-7 mm long. Peduncles 4-8 mm long. Hypanthium hemispherical, glabrous, 1.5-2 mm long. Sepals 4-5 mm long, 5-lobed, the lobes deeply fimbriate. Petals united with androecium, elliptic, entire, 5-7 mm long. Stamens 2-3 mm long, the filaments broad, the anthers clavate with a globose connective. Staminodes terete, obtuse, glandular. Style 3-4 mm long, bearded below apex with forked hairs. Ovules 8 or 9.

Distribution and habitat. Occurs in scattered localities from Byro Station S to Pindar and Mellenbye Stn near Yalgoo, E to Sandstone and Leonora and S towards Wialki, Western Australia (Figure 35). Grows in open rocky areas on granitic and lateritic hills .

Flowering period. Late August-October.

Conservation status. 3R.

Etymology. From the Latin *interior* (inner, interior), chosen by the late Charles Gardner to indicate the inland occurrence relative to most other species of the genus.

This distinctive species, first collected at Wurarga in 1909 by J.H. Maiden, resembles *V. picta* Endl. but has 10 fertile stamens. In habit it is sprawling or straggling, the leaves are verrucose, the petals are prominently clawed, the anthers dehisce by large openings, the staminodes are obtuse and the style is unilaterally bearded. There is variation especially in the width of the petals, most north-western specimens having wider petals about 3 mm wide.

Verticordia laciniata A.S. George, sp. nov.

Ad *Verticordiam chrysantham* Endl. affinis, a qua foliis canaliculatis breviter ciliatis, staminibus longioribus (3-3.5 mm longis), antherae appendicula majore plicata, et staminodiis subulatis laciniatis, differt.

Typus: SE of Walkaway on Burma Road, Western Australia, 29° 04' S, 115° 08' E, 4 September 1966, *A.S. George* 7856 (holo: PERTH; iso: CANB, K).

Related to *V. chrysantha*, from which it differs in the canaliculate shortly ciliate leaves, the longer stamens (3-3.5 mm long), the larger plicate anther appendage, and the subulate laciniate staminodes.

Distribution and habitat. Widespread from the Eradu area S to the Green Head-Coorow road, Western Australia (Figure 40). Grows in sand, sometimes over laterite, in low heath.

Flowering period. September-October.

Conservation status. Not rare or endangered.

Etymology. From the Latin *laciniatus* (divided into narrow, pointed divisions), in reference to the staminodes.

This species is related to *Verticordia chrysantha* Endl. but is easily distinguished by the channelled shortly ciliate leaves and the laciniate staminodes. Occasionally the leaves have few cilia. The stamens are larger than those of *V. chrysantha* and the anther appendage is also larger, and infolded. The species also resembles *V. nobilis* Meissner which is common in the same area but which may be distinguished especially by the large bifid anther appendage. Presumed hybrids between *V. laciniata* and *V. nobilis* have been recorded (see introductory section on Hybrids, above).

Verticordia lehmannii Schauer, in J.G.C. Lehmann, Pl. Preiss. 1: 99 (1844). *Lectotype* (here chosen): 'Molloy's plain', south-western Western Australia, 17 December 1839, *L. Preiss* 166 (LD; isolecto: BM, FI, G).

Typification. In the protologue, Schauer cited two localities (''Molloy's plain districti Sussex, et circa Sinum Regis Georgii''), both under the *Preiss* number 166. The collection selected as lectotype agrees better with Schauer's description. The other collection is the large-flowered variant of *Verticordia habrantha* Schauer and is probably from the Albany district since this variant of the species does not extend further west than Cranbrook. The lectotype is thus the collection from ''Molloy's plain'' which is not a current place name but is probably near the Vasse River where the Molloy family settled in the winter of 1839 (Hasluck 1955).

Verticordia lepidophylla F. Muell., Fragm. 1: 228 (1859). *Type*: Murchison River, Western Australia, 18--, *A. Oldfield* s.n. (holo: MEL; iso: K - 2 sheets).

In its typical form this species is relatively consistent morphologically, varying slightly in the petal margin being more evidently fringed in southern populations (though not as deeply as in *V. comosa*, described above). Plants near the coast, e.g. Kalbarri, 28 October 1985, *A.S. George* 16560 & *E.A. George* (PERTH), are more densely branched and have slightly smaller leaves.

North of the Murchison River, there are several populations that have smaller, less fimbriate sepals and entire petals. They are here described as *Verticordia lepidophylla* var. *quantula*.

Key to varieties

Sepals 3.5-4.5 mm long, divided for c. 2/3 their length into fimbriate lobes; petals dentate to erose at least on lateral margins ..... var. *lepidophylla*

Sepals 2-2.5 mm long, divided less than halfway into shortly fimbriate lobes, or simple with dentate margin; petals entire ..... var. *quantula* A.S. George

Verticordia lepidophylla var. **quantula** A.S. George, var. nov.

Ab *Verticordia lepidophylla* F. Muell. var. *lepidophylla* sepalis minoribus (2-2.5 mm longis) minus lobatis (non ad dimidium) et minus fimbriatis, et petalis integris, differt.

Typus: Vermin-proof Fence near N edge of Murchison House Station, Western Australia, c. 27° 15' S, 114° 16' E, 29 October 1986, *A.S. George* 16844 & *E.A. George* (holo: PERTH; iso: CANB, K, MEL, NSW, PERTH).

Differs from *V. lepidophylla* var. *lepidophylla* in the smaller (2-2.5 mm long) less deeply lobed and less fimbriate sepals and the entire petals.

Distribution and habitat. Recorded from two close localities N of Murchison House Station, upper south-western Western Australia (Figure 35). Grows in red sand over limestone in tall shrubland, and in yellow sand in heath. Locally common.

Flowering period. October-November.

Conservation status. 2V.

Etymology. Named from the Latin *quantulus* (how little), in reference to the shortly lobed and fimbriate sepals.

Because the sepals of this variety are short and little-fimbriate, its petals assume a dominant aspect in the flower. In a collection 16 km E of the type locality (29 October 1986, *A.S. George* 16851, PERTH), the sepals are simple or almost so and shortly fimbriate or dentate. This collection was just beginning to flower; the type is in full flower. It is likely that populations morphologically intermediate between the subspecies will be found between this area and those of typical *V. lepidophylla*.

Verticordia lindleyi Schauer, Nov. Act. Nat. Cur. 19, suppl. 2: 210 (1841). - *V. drummondii* Schauer var. *lindleyi* (Schauer) Benth., Fl. Austral. 3: 31 (1867).

Typical *Verticordia lindleyi* is characterised, within *Verticordia* sect. *Verticordella*, by the slightly concave shortly ciliate leaves, peduncles 2-4 mm long, a rounded ribbed hypanthium c. 2 mm long with short, rounded reflexed appendages, pale pink flowers, sepals 3-6 mm long, petals 3-4.5 mm long and entire to shortly dentate, and a style 3-4 mm long, markedly sigmoid below the apex. The species is common in south-western Western Australia from Gillingarra to Perth, with one collection from the Murray River. There is variation in the leaves from loosely appressed to widely

spreading, in flower size and in the petal apex. Typical plants have sepals 3-4 mm long and petals 3-3.5 mm long. Several collections, from localities over the species' range, have sepals up to 6 mm long and petals to 4.5 mm long, e.g. *V. Mann* 19 & *A.S. George*, Forrestdale (K, PERTH).

A new subspecies occurs inland, mainly from Brookton to Cranbrook.

Key to subspecies

Flowers pale pink; petals somewhat narrowed towards apex, entire to shortly dentate; staminodes shorter than stamens ..... subsp. *lindleyi*

Flowers purple or deep pink; petals broad at apex, coarsely serrate; staminodes longer than stamens ..... subsp. *purpurea* A.S. George

Verticordia lindleyi subsp. **purpurea** A.S. George, subsp. nov.

Ab *Verticordia lindleyi* var. *lindleyi* floribus plerumque purpureis vel intense roseis, petalis ad apicem latioribus grosse dentatis, et staminodiis quam staminibus longioribus, differt.

Typus: E of Albany Highway on road to Woodanilling, Western Australia, c. 33° 34' S, 117° 14' E, 24 November 1984, *E.A. Berndt* 78 (holo: PERTH; iso: CANB, K, MEL, NSW).

Differs from *V. lindleyi* subsp. *lindleyi* in having purple or deep pink flowers, the petals towards the apex broader and coarsely dentate, and the staminodes longer than the stamens.

Distribution and habitat. Widespread but scattered from the Brookton area to Cranbrook with outliers W to Darkin Swamp, Hillman, Collie and Tonebridge, Western Australia (Figure 35). Grows in sand, sandy loam and sand over gravel, in heathland and low open woodland, sometimes in low-lying areas.

Flowering period. Mainly November-December, but a few later records, including May.

Conservation status. 3R. Known populations are mostly on road verges in cleared agricultural areas.

Etymology. The Latin epithet refers to the typical flower colour.

Verticordia longistylis A.S. George, sp. nov.

Species bene distincta, ad *Verticordiam oxylepem* Turcz. affinis, sed foliis et floribus majoribus, petalis dense fimbriatis, et stylo 27-32 mm longo, praecipue differt. Frutex irregularis ad 70 cm altus. Folia conferta, linearia, triquetro-semiteretia, obtusa, 4-10 mm longa, purpureo-glauca, in petiolo ad 1 mm longo. Flores dissiti; pedunculi 4-5 mm longi; bracteoli non cuspidati, caduci. Hypanthium hemisphaericum, 5 mm longum, verrucosum, dense hirsutum. Sepala 6-7 mm longa, multifida, flava et purpurea. Petala ovata, concava, 2.5-3 mm longa, plerumque glabra praeter margines dense fimbriatos, flava. Stamina uniformia, 2.8-3 mm longa, glabra; anthera globularia, 0.7 mm longa appendiculo inconspicuo. Staminodia linearia, 2-2.2 mm longa, glandulosa. Stylus rectus, 27-32 mm longus, infra apicem pilis simplicibus barbatus. Ovuli 2.

Figure 24. Holotype of *Verticordia longistylis*. Scale in cm.

Typus: E of Roe Rock, E side of Fitzgerald River, Western Australia, 33° 59' S, 119° 24' E, 18 December 1970, *A.S. George* 10555 (holo: PERTH; iso: CANB, K, MEL, NSW, PERTH). Figure 24.

A distinctive species related to *V. oxylepis* but differing especially in the larger leaves and flowers, densely fimbriate petals and style 27-32 mm long. An irregular shrub to 70 cm tall. Leaves crowded, linear, triquetrous to semiterete, obtuse, 4-10 mm long, purple-glaucous; petiole to 1 mm long. Flowers scattered; peduncles 4-5 mm long; bracteoles not cuspidate, caducous. Hypanthium hemispherical, 5 mm long, verrucose, densely hirsute. Sepals 6-7 mm long, much-divided, yellow and purple. Petals ovate, concave, 2.5-3 mm long, usually glabrous except densely fimbriate margins, yellow. Stamens uniform, 3 mm long, glabrous; anthers globular, 0.7 mm long with an inconspicuous appendage. Staminodes linear, 2 mm long, glandular. Style straight, bearded below apex with simple hairs. Ovules 2.

Distribution and habitat. Recorded only near the Fitzgerald River E of Roe Rock, Fitzgerald River National Park, Western Australia (Figure 34). Grows on rocky spongolite platform above river valley, in open areas.

Flowering period. December-June.

Conservation status. 2RC.

Etymology. From the Latin *longus* (long) and *stylus* (style); the style is the longest in the genus.

This distinctive species is related to *Verticordia oxylepis* which occurs in the same region but more widely. *Verticordia longistylis* differs especially in the more upright habit, larger leaves and flowers, the petals fimbriate on the margin but otherwise almost glabrous, and the long style. The flowering period is probably long - the type is in early flower, while *A.S. George* 10001 (collected at the type locality on 13 July 1970), has a few late flowers.

Verticordia luteola A.S. George, sp. nov.

Ad *Verticordiam bifimbriatam* affinis, a qua floribus luteis et albis, sepalis lobis pluribus (7-9) sed sine auriculis, et staminibus brevioribus (1.5 mm longis), praecipue differt.

Typus: SW of Three Springs, Western Australia, 10 December 1961, *A.S. George* 3219 (holo: PERTH; iso: B, CANB). Figure 25.

Related to *V. bifimbriata*, from which it differs especially in the yellow and white flowers, the sepals with more numerous (7-9) lobes but lacking auricles, and the shorter stamens (1.5 mm long).

Distribution and habitat. Restricted to an area SW and W of Three Springs, Western Australia, with a collection from near Mt Adams (Figure 41). Grows in sand over gravel, in heath.

Flowering period. November-December.

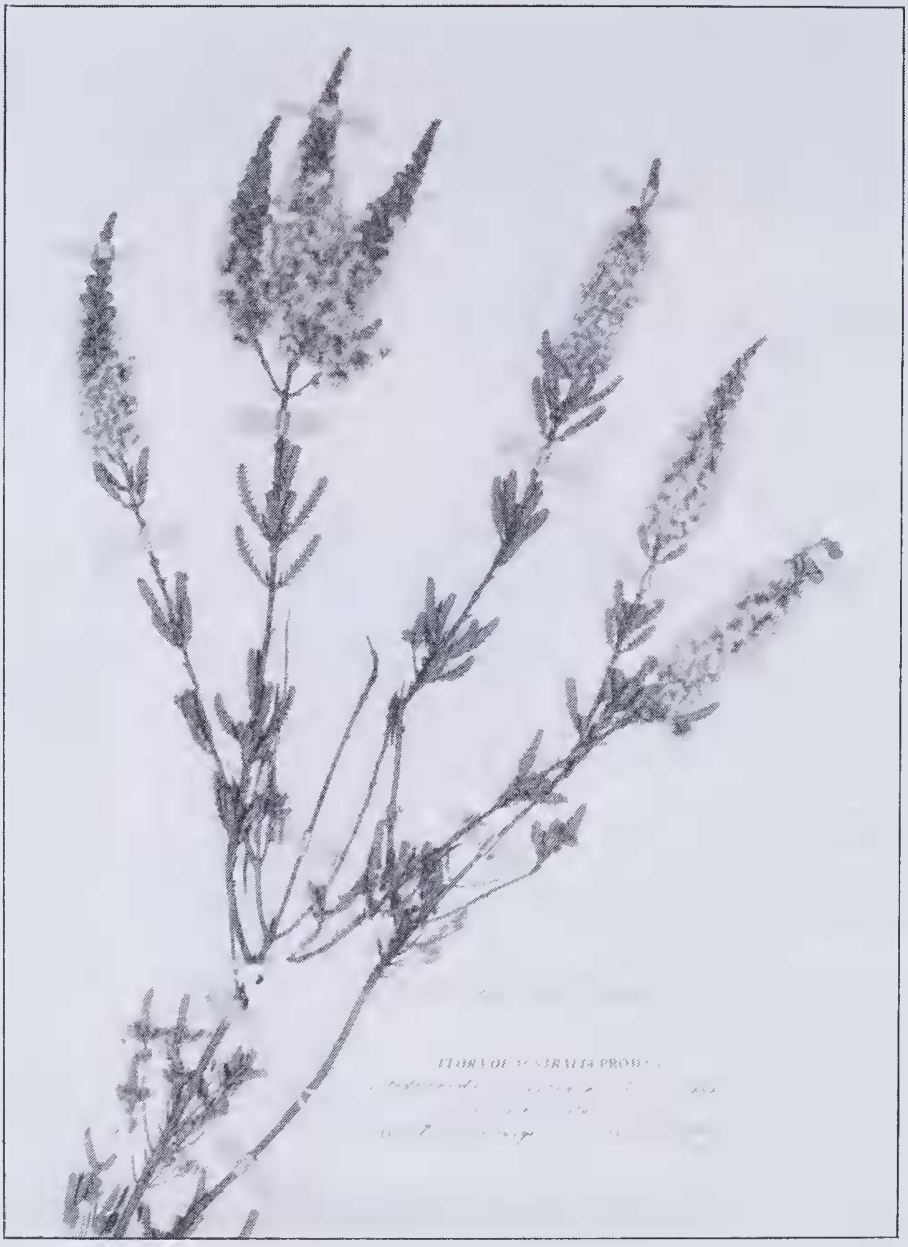

Figure 25. Holotype of *Verticordia luteola*. Scale in cm.

Conservation status. 2E. Only six collections seen, all from road verges in heavily cleared areas.

Etymology. Named from the Latin *luteolus* (pale yellow) in reference to the dominant flower colour.

This is the only species of *Verticordia* sect. *Verticordella* with yellow or yellow and white flowers, although *V. pholidophylla* may be creamish. Morphologically *V. luteola* closely resembles *V. bifimbriata* in having moderately large flowers and bi-fringed petals. The reflexed appendages of the hypanthium are more swollen, the sepals have 7-9 lobes and very few reflexed cilia, and the stamens and staminodes are shorter. The collection from near Mt Adams was said to have 'greenish white' flowers.

Verticordia minutiflora F. Muell., Fragm. 4: 58 (1864).

Verticordia fontanesii var. *parviflora* Benth., Fl. Austral. 3: 21 (1867). *Lectotype* (here chosen): Lucky Bay, [Western Australia], Jan. 1802, *R. Brown* Iter Australiense 4572 (K; probable isolecto: MEL).

Typification. Besides the lectotype, the type sheet of *V. fontanesii* var. *parviflora* bears a collection of *V. sieberi* Diesing ex Schauer, which has flowers about as large as those of typical *V. plumosa* (of which *V. fontanesii* is a synonym). This has the Iter Australiense number 4567. Neither collection has been annotated by Bentham as *V. fontanesii* var. *parviflora*, nor has this name been found on any other sheet named by him as *V. fontanesii*. Since no. 4572 has much smaller flowers it is selected as lectotype. The name is a synonym of *V. minutiflora* F. Muell.

Verticordia mitodes A.S. George, sp. nov.

Ab speciebus parvifloris *Verticordiae* sect. *Verticordellae* (e.g. *V. auriculata*, *V. centipeda*) foliis minoribus et petalorum fimbriis terminalibus longioribus lateralibus nullis praecipue differt. Frutex ad 50 cm altus. Folia 1-2 mm longa, 0.5-1 mm lata, plerumque cinerea. Pedunculi 2-3.5 mm longi. Hypanthium 2.2 mm longum, costatum; appendiculi 1-1.5 mm longi. Sepala 3-4 mm longa, lamina quadrata, auriculis basalibus gracilibus. Petala 4-5 mm longa fimbriis ad 3 mm longis. Stylus 5-6 mm longus; barba pilis 0.2-0.4 mm longis.

Typus: Bronti, E of Southern Cross, Western Australia, 7 December 1936, *C.A. Gardner* s.n. (holo: PERTH; iso: K, MEL).

Differs from the small-flowered species of *Verticordia* sect. *Verticordella* (e.g. *V. auriculata*, *V. centipeda*) especially in the smaller leaves and the petals with the terminal fringe longer than the lamina but no lateral fringe. A shrub to 50 cm tall. Leaves 1-2 mm long, 0.5-1 mm wide, usually greyish. Peduncles 2-3.5 mm long. Hypanthium 2.2 mm long, ribbed; appendages 1-1.5 mm long. Sepals 3-4 mm long, the lamina quadrate, the basal auricles slender. Petals 4-5 mm long, including fimbriae to 3 mm long. Style 5-6 mm long, the beard hairs 0.2-0.4 mm long.

Distribution and habitat. Occurs in inland areas of south-western Western Australia from Nungarin to Bungalbin, NE of Koolyanobbing, S to near the Parker Range and W towards Narembeen (Figure 34). Grows in yellow sand in shrubland.

Flowering period. November-December.

Conservation status. 3R.

Etymology. The specific epithet *mitodes* (Greek, threadlike), refers to the long fringe of the petals.

Verticordia mitodes is closely related to *V. auriculata* and *V. centipeda*. It may be distinguished from those species especially by the small, usually spreading, grey-green leaves, the slender basal auricles of the sepals, and the petal fringe which is longer than the lamina. The plant usually has many erect to spreading branches forming a ± rounded shrub with pale pink flowers. The petal lamina is ± rectangular and has no lateral fringe. In two collections (*G.J. Keighery* 4410 and *M.E. Trudgen* 5524, both at PERTH), the leaves are brighter green and the flowers deep pink.

Verticordia monadelpha Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 158 (1847). *Holotype*: south-western Western Australia, 184-, *J. Drummond* 3: 27 (KW; iso: BM, CGE, FI, K, MEL, NY, W).

Verticordia monadelpha is widespread between Kalbarri, Eneabba and Koorda, Western Australia. Within this range it is quite variable in habit, size of floral parts, and to some extent flower colour. This variation is here formally recognised as two varieties.

Key to varieties

Petals 3.5-5 mm long; stamens 3-3.5 (rarely 4) mm long, the staminodes usually at least half as long; anthers 0.3 mm wide ..... var. *monadelpha*

Petals 3-3.5 (rarely 4) mm long; stamens 4-5 mm long, the staminodes less than half as long; anthers 0.2 mm wide.. var. *callitricha* (Meissner) A.S. George

Verticordia monadelpha Turcz. var. **monadelpha**

Shrub to 1.5 m, somewhat openly branched or corymbose. Sepals 5-8 mm long. Petals 3.5-4 mm long, rarely to 5 mm. Stamens 3-3.5 mm long, rarely to 4 mm; anthers 0.3 mm wide. Staminodes 1/2-3/4 length of stamens.

Distribution and habitat. Occurs from the Moresby Range S to Eneabba and SE through Perenjori almost to Koorda, Western Australia. Grows in deep sand and gravelly loam, in heath.

Flowering period. Late October-December.

Conservation status. Not rare or endangered.

Typical *Verticordia monadelpha* var. *monadelpha* has bright pink flowers, sepals 7-8 mm long and petals c. 4 mm long. It occurs mainly in the eastern and south-eastern parts of the variety's range. Western populations are more openly branched plants with pale pink flowers, sepals 5-7 mm long and petals 3.5-4 mm long.

Verticordia monadelpha var. **callitricha** (Meissner) A.S. George, comb. et stat. nov. - *Verticordia callitricha* Meissner, J. Proc. Linn. Soc., Bot. 1: 39 (1857). *Lectotype* (here chosen): south-western Western Australia, 1850/51, *J. Drummond* 6: 48 (NY; *isolecto*: BM, CGE, FI, K - 2 sheets, MEL, NY, W).

Typification. The sheet selected as lectotype does not have Meissner's determination but has a blue label with the collection details probably in his hand and is from his herbarium.

Shrub to 70 cm, occasionally to 1.3 m, usually rounded and dense. Sepals 5-6 mm long. Petals 3-3.5 mm long, rarely to 4 mm. Stamens 4-5 mm long; anthers 0.2 mm wide. Staminodes less than half length of stamens.

Distribution and habitat. Occurs from Kalbarri SE to Yuna and S almost to Morawa, Western Australia. Grows in deep sand and gravelly sand in heath and tall shrubland.

Flowering period. November-January.

Conservation status. Not rare or endangered.

This variety is typically distinguished by the character states given above. The slightly shorter petals but longer stamens result in the latter being shortly exserted.

Verticordia muelleriana E. Pritzel, Bot. Jahrb. 35: 407, fig. 48 N-S (1904). *Type*: between Watheroo and Coorow, Western Australia, November 1901, *E. Pritzel* (not found). *Neotypus* (here nominated): N of Marchagee, Western Australia, 5 December 1978, *D. Butcher* 1192 (PERTH; isoneo: B, MEL).

Typification. No specimen of Pritzel's type collection (or indeed of the paratype *Diels* 5791, also cited by Pritzel in the protologue) has been found in the many herbaria consulted, including B. Tantalisingly, there is a label at B of the Diels collection but it is on a sheet of *V. grandis*, a species collected by Diels and Pritzel (*Pritzel* 614) and illustrated by them (op. cit. 408, fig. 48 K-M). The label must have been wrongly transposed. A neotype is therefore nominated for *V. muelleriana*. It agrees well with the protologue and is from a locality between Watheroo and Coorow.

Within the '*chrysostachys*' group of *Verticordia* sect. *Pennuligera*, *V. muelleriana* is characterised by the large orbicular leaves with narrow white margin, maroon to blood red flowers, very glandular staminodes, and style with curved apex and beard of crowded long hairs (to 1.2 mm long) surrounding the style. In its main area of distribution - between Coorow and Watheroo and a short distance westward - it is relatively consistent morphologically.

In the Wicherina area, east of Geraldton, there is a variant here formally described as subsp. *minor*.

Key to subspecies

Sepals 5 mm long; petals 5 mm long including fringe to 1.5 mm long; style hairs to 1.2 mm long, crowded ..... subsp. *muelleriana*

Sepals 3.5 mm long; petals 4 mm long including fringe to 0.5 mm long; style hairs to 0.6 mm long, ± open ..... subsp. *minor* A.S. George

Verticordia muelleriana E. Pritzel subsp. **muelleriana**

Distribution and habitat. Occurs between Coorow and Watheroo and a short distance westward. Grows in deep sand in tall shrubland.

Flowering period. Late October-December.

Conservation status. 2V.

Verticordia muelleriana E. Pritzel subsp. **minor** A.S. George

Ab *Verticordia muelleriana* subsp. *muelleriana* floribus minoribus et styli barbae pilis brevioribus minus confertis differt.

Typus: Wicherina South Rd, S of Geraldton - Mullewa road, Western Australia, 10 December 1988, *P. & N. Moyle* 25A & *E.A. George* (holo: PERTH; iso: CANB).

Differs from *V. muelleriana* subsp. *muelleriana* in the smaller flowers and shorter, less crowded hairs of the beard of the style.

Distribution and habitat. Known only from a small area around the type locality, where there are many plants over a distance of c. 1 km (Figure 42).

Flowering period. November- December.

Conservation status. 2E.

Etymology. The Latin epithet *minor* refers to the smaller size of the flowers.

The subspecies appears to hybridise frequently with V. *chrysostachys* var. *pallida* which occurs at the same locality.

Verticordia multiflora Turcz., Bull. Soc. Imp. Naturalistes Moscou 20: 159 (1847). *Type*: south-western Western Australia, 184-, *J. Drummond* 3: 26 (holo: KW; iso: BM, CGE, E, FI, K - 3 sheets, MEL, P, W).

This species, at one time confused with *Verticordia brachypoda* Turcz. (and its synonym *V. stylotricha* Diels), may be distinguished from that species by its bright yellow flowers and subulate staminodes. It also resembles the yellow-flowered varieties of *V. huegelii* Endl. (var. *stylosa* and var. *tridens*) but is readily distinguished from them by its scarcely enlarged stigma and entire staminodes. *V. multiflora* has two subspecies.

Key to subspecies

Sepals 4-4.5 mm long; petals 2.5-3 mm long; style 3-3.5 mm long ..... subsp. *multiflora*

Sepals 5-6 mm long; petals 3.5-5 mm long; style 4-5.3 mm long ..... subsp. *solox* A.S. George

Verticordia multiflora Turcz. subsp. **multiflora**

Shrub to 50 cm with ± straggly spreading stems. Leaves linear, semiterete, obtuse, 2-7 mm long, sessile. Hypanthium turbinate, 1.8-2 mm long, densely comose at base, the 10 ribs also hirsute. Sepals 4-4.5 mm long, deeply fimbriate. Petals 2.5-3 mm long, fimbriate. Stamens 0.6-0.8 mm long; staminodes subulate, 1.8-2.5 mm long. Style 3-3.5 mm long, long-hirsute; stigma capitate, c. 0.5 mm diam.

Distribution and habitat. Occurs in scattered localities from Darkin Swamp, NW of Brookton, S almost to the Porongurup Range, Western Australia, with an outlier SE of Lake Grace (Figure 39). Grows in clay-loam over laterite in low open woodland and heath.

Flowering period. October-November.

Conservation status. 3R.

Verticordia multiflora Turcz. subsp. **solox** A.S. George, subsp. nov.

Ab *Verticordia multiflora* subsp. *multiflora* floribus majoribus, et sepalorum divisionibus plus grossis, differt. Sepala 5-6 mm longa. Petala 3.5-5 mm longa. Stamina 0.8-1.1 mm longa. Stylus 4.5-5.3 mm longus.

Typus: SE of Moorine Rock, Western Australia, c. 31° 35' S, 119° 30' E, 22 October 1984, *A.S. George* 16447 & *E.A. Berndt* (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Differs from *V. multiflora* subsp. *multiflora* in the larger flowers and coarser divisions of the sepals. Sepals 5-6 mm long. Petals 3.5-5 mm long. Stamens 0.8-1.1 mm long. Style 4.5-5.3 mm long.

Distribution and habitat. Occurs from SE of Merredin to Marvel Loch, Western Australia (Figure 39). Grows in pale yellow sand, gravelly sand, and sand over granite, in tall open shrubland.

Flowering period. October-November.

Conservation status. 2R.

Etymology. From the Latin *solox* (shaggy, rough); the much-divided sepals give the flowers a more shaggy aspect than those of subsp. *multiflora*.

Besides the differences in size, *Verticordia multiflora* subsp. *solox* has sepals that are divided into more numerous and coarse fimbriae.

Verticordia nitens (Lindley) Endl., Stirp. Herb. Huegel. 7 [1838] (1839) (as *V. nitida*) - *Chrysorhoe nitens* Lindley, Comp. Bot. Mag. 2: 357 (1836). *Holotype*: Swan River, Western Australia, 183-, - *Toward* s.n. (CGE).

Typification. The holotype is the only collection of the species at CGE, where most of Lindley's types are housed. It is annotated in his hand.

This is the correct author citation for this species whose combination has often been wrongly attributed to Schauer, who made the same combination in 1841.

Verticordia nobilis Meissner, J. Linn. Soc., Bot. 1: 39 (1856). *Type*: near Smith R., Western Australia, 1850-51, *J. Drummond* 6: 47 (holo: NY; iso: BM, CGE, FI, K-2 sheets, LD, NSW, P-3 sheets, W).

This species is here reinstated, the name having been placed in synonymy under *V. grandiflora* Endl. since Bentham (1867). It may be distinguished from that species especially by the larger flowers on longer peduncles, by the larger, erect stamens and the longer exserted style. The leaves are usually longer and the upper ones usually not on short lateral branchlets as are those of *V. grandiflora*.

Verticordia nobilis grows to the north of Perth from Gingin to Kalbarri, whereas *V. grandiflora* is to the east and south east.

Verticordia oculata Meissner, J. Linn. Soc., Bot. 1: 41 (1856). *Lectotype* (here chosen): between Hutt River and Murchison River, Western Australia, 1850/51, *J. Drummond* 6: 43 (NY; isolecto: BM, CGE - 2 sheets, FI, K - 3 sheets, LD, NSW, W).

Typification. For most of Meissner's species of *Verticordia* there are types at NY, annotated by him, that can be taken as holotypes. This is not the case with *V. oculata*, for which the NY sheet bears a label in his hand but without determination. Since he saw the specimen, however, it is here selected as lectotype.

Verticordia ovalifolia Meissner, J. Linn. Soc., Bot. 1: 40 (1856). *Lectotype* (here chosen): south-western Western Australia, 1850/51, *J. Drummond* 6: 45 (NY; isolecto: CGE, K - 2 sheets, LD, W).

Typification. As with *V. oculata*, the sheet at NY bears a label with the details in Meissner's hand but not determined by him.

Verticordia oxylepis Turcz., Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint Petersbourg 10: 327 (1852). *Lectotype* (here chosen); south-western Western Australia, 184-, *J. Drummond* 5: 113 (KW; *isolecto*: K-3 sheets; syn (see below): CGE, FI, K, KW, NSW, W).

Verticordia demissa F. Muell. ex Benth., Fl. Austral. 3: 25 (1867). *Lectotype* (here chosen): south-western Western Australia, *J. Drummond* 5: 113 (K; isolecto: CGE, FI, K - 2 sheets, NSW, W). *Other syntype*: Fitzgerald ranges, *G. Maxwell* (BM).

Typification. The type sheet of *V. oxylepis* at KW, annotated by Turczaninow, bears three specimens, all of the same taxon but from different plants and possibly localities. That selected as lectotype is the most mature plant and has Drummond's number tag attached. A second has two burnt stem bases with a regrowth shoot in flower, while the third is similar to this but without the burnt stems. The sheets at K have specimens of each collection. The specimen selected as lectotype for *V. demissa* corresponds morphologically with the lectotype of *V. oxylepis*.

Verticordia paludosa A.S. George, sp. nov.

Inter species *Verticordiae* sect. *Verticordellae* ad *V. bifimbriatam* arcte affinis, a qua foliis floralibus latioribus ciliatis, bracteolis ciliatis, floribus pallide roseis, appendicibus reflexis in hypanthium transientibus, sepalis 6-7-lobatis non auriculatis, petalis parce brevioribus, staminibus staminodiisque brevioribus et breviter unitis, stylo parce breviore, et florescentia serotina, differt.

Typus: Red Gully Road, adjacent to Moore River National Park, Western Australia, c. 31° 05' S, 115° 45' E, 11 January 1973, *N.T. Burbidge* 8061 (holo: PERTH; iso: CANB, K, MEL). Figure 26.

Closely related to *V. bifimbriata* from which it differs in the broader ciliate floral leaves, ciliate bracteoles, pale pink flowers, the reflexed appendages of the hypanthium merging into the hypanthium, the 6-7-lobed non-auriculate sepals, the slightly shorter petals, the shorter stamens and staminodes, the slightly shorter style, and the later flowering period.

Distribution and habitat. Restricted to an area between Mogumber, Gillingarra, Regans Ford and the S end of Moore River National Park, Western Australia (Figure 37). Grows in sand in shrubland and low open woodland, usually on winter-wet flats.

Flowering period. January-May.

Conservation status. 2V. The few collections are from an area being increasingly cleared.

Etymology. The specific epithet (Latin, *paludosus*), refers to the habitat.

A distinctive feature of this species is the reflexed appendages which merge into the hypanthium, in contrast to the semi-detached form in other taxa of *Verticordia* sect. *Verticordella*. The shortly ciliate bracteoles are also unique in the section. The petals are usually bifimbriate.

One collection (Gillingarra, *A. Popplewell*, PERTH) has the leaves more crowded and narrower than typical plants. Another (Boonanarring Brook, 20 March 1986, *J.J. Alford* 399 (PERTH) has the petal fringe mostly simple.

Verticordia pennigera Endl., Enum. Pl. 46 (1837)

Verticordia setigera Lindley, Sketch Veg. Swan R. vii (1839). *Lectotype* (here chosen): Swan River, Western Australia, 183- *J. Drummond* s.n. (CGE). *Other syntypes*: Vasse River, Western Australia, 183-, *Georgiana Molloy* (CGE); Swan River, Western Australia, 183-, *J. Mangles* (CGE).

Figure 26. Holotype of *Verticordia paludosa*. Scale in cm.

Typification. The three collections on the type sheet of *V. setigera* all represent the same taxon as *V. pennigera*. Drummond's specimen is the best of the three.

Verticordia picta Endl., Stirp. Herb. Huegel 3: 6 [1838] (1839). *Lectotype* (here chosen): south-western Western Australia, 183-, *J.S. Roe* (W). *Syntype*: same locality and collector (BM, W).

Verticordia pentandra Turcz., Bull. Soc. Imp. Naturalistes Moscou 20, 1: 157 (1847). *Type*: south-western Western Australia, *J. Gilbert* 329 (holo: KW).

Typification. The type sheet of *V. picta* at W is annotated 'N. H. a. O. (Roe n. 3.)', i.e. Novae Hollandiae australis Occidentalis, and has two specimens labelled 5 and 23, although Roe apparently did not use collection numbers. Because the specimens appear to be from different plants (and possibly localities), one is selected as lectotype, being that associated with the number 23. The flower has 5 fertile stamens, Endlicher having erred in implying in the protologue that there were 10.

Turczaninow, in the protologue of *V. pentandra*, described the staminal filaments as ciliolate, but they are in fact glabrous. He may have mistaken the style beard as staminal hairs.

Verticordia pityrhops A.S. George, sp. nov.

Ad *Verticordiam harveyi* Benth. affinis, a qua habitu piniformi, foliis confertis, et floribus minoribus, differt. Folia 7-14 mm longa; hypanthium 2 mm longum; sepala 2 mm longa; petala 2 mm longa; stamina 1 mm longa; stylus 5 mm longus.

Typus: East Mt Barren, [Fitzgerald River National Park], Western Australia, 33° 55' S, 120° 02' E, 17 March 1972, *A.S. George* 11296 (holo: PERTH; iso: CANB, K, MEL, NSW). Figure 27.

Related to *V. harveyi*, from which it differs in the pine-like habit, crowded leaves and smaller flowers. Leaves 7-14 mm long. Hypanthium 2 mm long. Sepals and petals 2 mm long. Stamens 1 mm long. Style 5 mm long.

Distribution and habitat. Known only from East Mt Barren, Fitzgerald River National Park, Western Australia, where it occurs on the platform c. 100 m above sea level (Figure 34). Grows in white sand among quartzite rocks, in open heath.

Flowering period. February-June.

Conservation status. 2VC. Although in a National Park, the only known population is small and is divided by a recently-built road.

Etymology. From the Greek *pitys* (a pine) and *rhops* (a shrub), in reference to the small pine-like habit.

Related to *V. harveyi* but distinct especially in the small dense habit, long crowded leaves and small flowers.

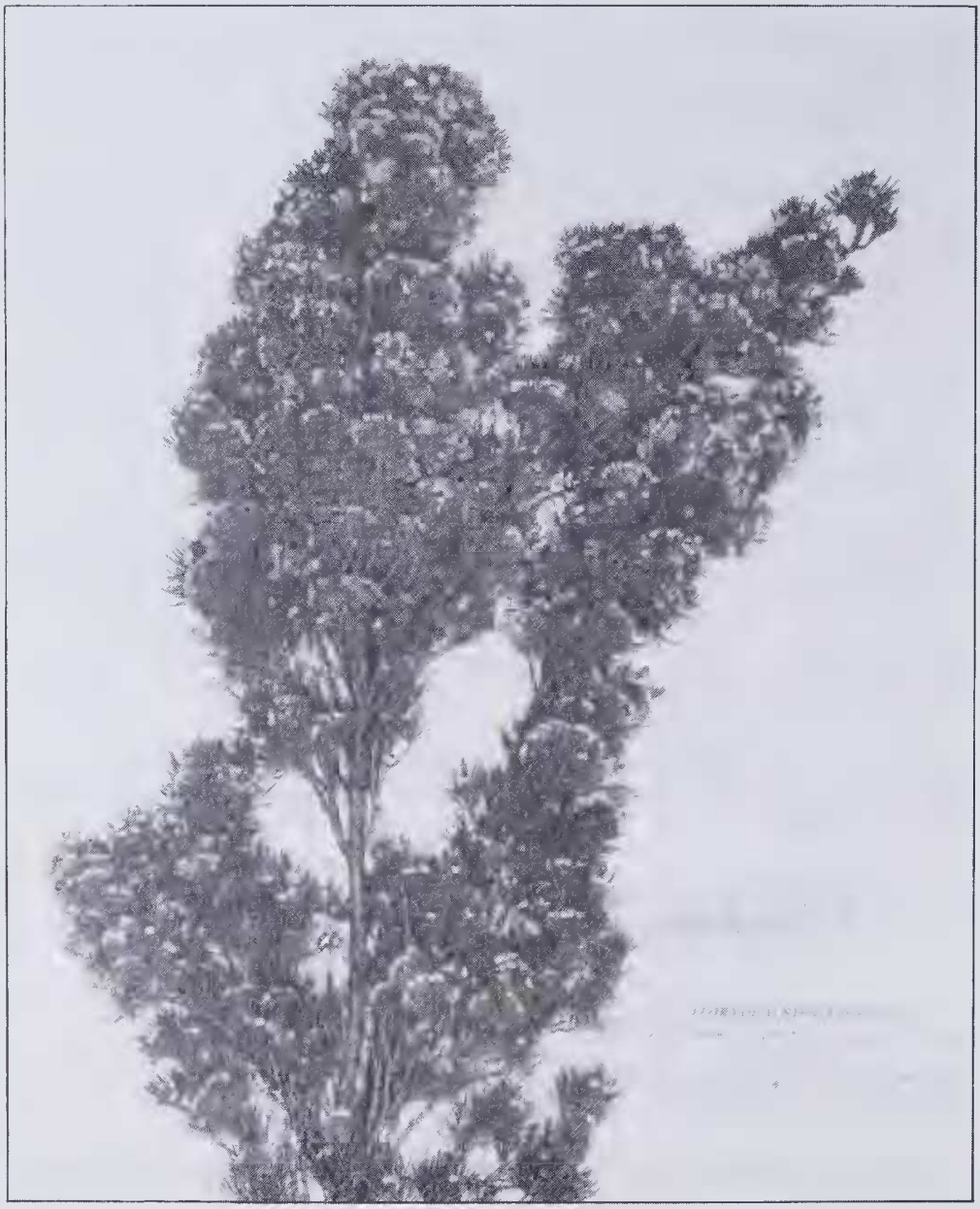

Figure 27. Holotype of *Verticordia pityrhops*. Scale in cm.

Verticordia plumosa (Desf.) Druce, Rep. Bot. Exch. Club Brit. Isles 1916, 651 (1917). - *Chamelaucium plumosum* Desf., Mem. Mus. Hist. Nat. 5: 42, t. 4 (1819). - *Verticordia fontanesii* DC., Prodr. 3: 209 (1828), nom. illeg. *Lectotype* (here chosen): locality not given, but probably King George Sound, [Western Australia], 1803, *J. Leschenault* (FI; isolecto: BM, FI, P).

Typification. The lectotype specimen is one of four on a sheet at FI. The sheet is labelled "Camelaucium [sic] plumosum Mem. du mus." in a shaky hand, probably that of Desfontaines. The lectotype strongly resembles Desfontaines' plate of *Chamelaucium plumosum.* The isolectotype sheet at FI is from Labillardière's herbarium and bears the locality "Port du Roi Georges", i.e. King George Sound.

The specimens at BM and P have the same locality, the BM sheet also having the date 1803.

As here circumscribed, *V. plumosa* is the most variable species of the genus. Seven varieties are recognised, but there are intermediate specimens linking most of these. The complex would be an excellent subject for a post-graduate study.

The varieties are distinguished by combinations of character-states in respect of habit, leaf form, peduncle form, flower size and colour, indumentum of hypanthium, sepal lobes and habitat. Leaf width and thickness are measured at the widest point.

Key to varieties

1a Sepals 4-5 mm long; petals 3.5-4.5 mm long; sepals and petals white, rarely mauve ..... var. *grandiflora* (Benth.) A.S. George

1b Sepals 1.5-4 mm long; petals 2-3.8 mm long; sepals and petals pink or mauve, rarely white

2a Sepals 1.5-2.5 mm long

3a Flowers in many small groups on short lateral branches; sepal lobes narrow; petals 1.1-1.5 mm wide; Mundijong district ..... var. *pleiobotrya* A.S. George

3b Flowers in groups towards main branch apices; sepal lobes broad; petals 2 mm wide; Busselton - Bunbury district ..... var. *vassensis* A.S. George

2b Sepals 2.5-4 mm long

4a Leaves 7-14 mm long, slender; peduncles 3-7 mm long

5a Bushy shrub to 80 cm; leaves slightly glaucous; occurs on granite hills of the western Darling Plateau and between Windy Harbour and Albany ..... var. *plumosa*

5b Tufted shrub to 40 cm; leaves not glaucous; probably grows on low-lying flats, between Serpentine and Busselton ..... var. *ananeotes* A.S. George

4b Leaves 1.5-7 mm long, somewhat thickened; peduncles usually 4-11 mm long

6a Leaves 0.5-0.6 mm thick; peduncles 7-11 mm long; hypanthium 2 mm long; sepals 2.5-3.5 mm long ..... var. *brachyphylla* (Diels) A.S. George

6b Leaves usually 0.7-0.9 mm thick; peduncles 4-8 mm long; hypanthium 1.4-1.5 mm long; sepals 3-4 mm long ..... var. *incrassata* A.S. George

Verticordia plumosa (Desf.) Druce var. **plumosa**

Shrub to 80 cm without lignotuber. Stems densely to somewhat openly branched, the short lateral branchlets ± crowded, with crowded leaves. Leaves 7-10 mm long, 0.4-0.6 mm wide, ± glaucous. Peduncles 3-7 mm long. Hypanthium turbinate, 2 mm long, densely hirsute. Sepals and petals pink. Sepals 3-3.5 mm long; lobes broad, shortly fimbriate in upper part. Petals 3.5-3.8 mm long.

Distribution and habitat. Occurs in south-western Western Australia near the S coast from Windy Harbour to Albany, along and E of the Darling Scarp between Red Hill and Jarrahdale, and at scattered localities between these areas, e.g. Mt William, Boyanup. Grows on granitic slopes, in heath.

Flowering period. August-December.

In typical *Verticordia plumosa* var. *plumosa* the groups of flowers are small and borne on many of the short lateral branchlets. Darling Range populations have larger, more rounded groups of flowers mostly at the main branch apices. Collections intermediate in form include Helena River, October 1919, *C.S. Bardwell-Clarke* (PERTH); Mt Chudalup, 30 October 1972, *G.J. Keighery* 1369 (PERTH); and The Gap, Albany, 15 August 1951, *R.D. Royce* 3738a (PERTH). Several collections, from widely dispersed localities, have narrow sepal lobes, e.g. Mt Chudalup,19 January 1966, *F. Lullfitz* 4709 (PERTH); Mundaring, 10 July 1979, *R. Cranfield* 878 (PERTH).

Verticordia plumosa var. **pleiobotrya** A.S. George, var. nov.

Inter varietates alias *Verticordiae plumosae* floribus parvis, lobis sepalorum angustis et petalis angustis praecipue distinguitur. Ad var. *vassensis* arcte affinis, sed turmis florum plus numerosis in ramulis lateralibus brevibus, lobis sepalorum angustioribus acutis, et petalis angustioribus (1.1-1.5 mm latis), differt.

Typus: near Mundijong, Western Australia, 32° 18'S, 115° 57'E, 7 November 1986, *A.S. George* 16902 & *E.A. George* (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Distinguished among the other varieties of *Verticordia plumosa* especially by the small flowers, narrow lobes of the sepals and narrow petals. Closely related to var. *vassensis* but differs in the more numerous groups of flowers on short lateral branchlets, the narrower sepal lobes and the narrow petals

(1.1-1.5 mm wide). Leaves mostly 4-8 mm long, slightly glaucous. Peduncles usually 1.5-3 mm long but up to 8 mm. Hypanthium 1.8-2.4 mm long. Sepals 2.3-2.5 mm long. Petals 2-2.4 mm long.

Distribution and habitat. Restricted to a small area to the west and south west of Mundijong, south east of Perth, Western Australia (Figure 43). Grows on clay and sandy-loam flats in low shrubland.

Flowering period. October-November.

Conservation status. 2E. Known from only a few small populations on road verges in a heavily cleared area.

Etymology. Varietal name from the Greek *pleio-* (more than usual) and *botrys* (a bunch), in reference to the many small lateral groups of flowers.

Verticordia plumosa var. **ananeotes** A.S. George, var. nov.

Inter varietates alias *Verticordiae plumosae* turma characterorum sequenti distinguitur: frutex lignotubere caulibus pluribus ad 40 cm altis; foliis 6-14 mm longis, 0.4-0.7 mm latis; pedunculis 4-7 mm longis; hypanthio 1.5 mm longo; sepalis 3-3.5 mm longis, lobis 3 vel 4 breviter dentatis.

Typus: Molloy's Plains, Sussex District, Western Australia, 17 December 1839, *L. Preiss* 174 (holo: LD; iso: BM, NY, W).

Shrub with small lignotuber and several to many simple or sparsely branched stems to 40 cm. Leaves sparsely arranged on main stems but crowded on short axillary branchlets, 6-14 mm long, 0.4-0.7 mm wide, abruptly acute. Flowers in small groups. Peduncles 4-7 mm long. Hypanthium 1.5 mm long, stiffly hirsute. Sepals 3-3.5 mm long; main lobes 3 or 4, very shortly and irregularly lobed towards apex.

Distribution and habitat. Recorded at Serpentine, "Murray District" (i.e. between Mundijong and Waroona), Blackwood River, and Vasse River and "Molloy's Plains, Sussex District", i.e. near Busselton, Western Australia (Figure 39). Grows in sandy soil in open Jarrah woodland (Murray District) and on a sandy plain (Molloy's Plains).

Flowering period. November-December.

Conservation status. Unknown. Collected six times between 1839 and 1900, but not since.

Etymology. Named from the Greek *ana-* (again) and *neos* (new, recent), in reference to the plant's ability to resprout after fire from its small woody stock.

This variety is easily recognised by its distinctive habit. The specimens appear to be parts of plants, hence the habit is probably densely tufted. The simple stems, long internodes and long slender leaves are also distinctive.

Verticordia plumosa var. **vassensis** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae plumosae* sepalis brevibus 1.5-2.3 mm longis et petalis 2-2.4 mm longis praecipue differt. Frutex sine lignotubero. Folia 3-7 mm longa, 0.3-0.5 mm lata. Pedunculi 1.5-4 mm longi.

Typus: Ambergate, Busselton district, Western Australia, c. 33°41' S, 115° 18' E, 20 October 1950, *R.D. Royce* 3413 (holo: PERTH; iso: CANB, K).

Shrub without lignotuber and several erect to spreading open main branches, to 1 m tall and wide. Internodes of main branches mostly 10-15 mm apart. Leaves slightly thickened upwards, obtuse or almost acute, 3-7 mm long, 0.3-0.5 mm wide and thick, ?medium green. Peduncles 1.5-4 mm long. Flowering branches corymbose. Hypanthium 1.8-2 mm long, silky-hirsute. Sepals 1.5-2.3 mm long; main lobes 4-6, broad, shortly plumose, erose towards apex. Petals 2-2.4 mm long.

Distribution and habitat. Occurs in far south-western Western Australia from Ambergate to Ruabon and Tutunup (Figure 37). Grows on winter-wet sandy flats.

Flowering period. October-January.

Conservation status. 2E. Endangered since all known plants are on road and railway verges in a well-cleared area.

Etymology. Named for the Vasse district in which the variety occurs, with the suffix *-ensis* (relating to).

Differs from other varieties in the short peduncles and small flowers. Several collections are intermediate morphologically between *Verticordia plumosa* var. *vassensis* and var. *brachyphylla*. These include Darkin Swamp, 12 November 1981, *A. Selkirk* 11 (PERTH), and S of Bowelling, 29 September 1985, *V. Crowley* 7 (PERTH), which have pedicels 3-6 mm long and sepals c. 2 mm long.

A collection from Corbalup Road near Manjimup, December 1985, *A.Annels* 1, (PERTH), appears intermediate between var. *vassensis* and var. *plumosa*. It contains 2 specimens, one with sepals c. 2 mm long, the other 3 mm. The leaves are mostly 3-5 mm long, only slightly thickened, and the peduncles are up to 12 mm long. A similar collection is from Three Chain Road, Scott River, October 1980, *E. Russell* (PERTH); it has long peduncles but sepals 2 mm long.

Verticordia plumosa var. **brachyphylla** (Diels) A.S. George, comb. nov. *Verticordia fontanesii* DC. var. *brachyphylla* Diels, Bot. Jahrb. 35: 403 (1904). *V. plumosa* var. *brevifolia* (F. Muell.) Domin, Mém. Soc. Sci. Bohême 1921-22, 2: 79 (1923), nom. illeg.

Lectotype (here chosen): near Waeel, Western Australia, October 1901, *E. Pritzel* Pl. Austr. occ. 820 (K; isolecto: BM, E, NSW).

Typification. The type collection is uniform. There is no sheet at B, and the lectotype bears a Pritzel label with the name and collection details.

Domin cited in synonymy *V. fontanesii* var. *brevifolia* F. Muell., Fragm. 10: 28 (1876). The phrase "varietatem brevifoliam" there used by Mueller appears, however, to be a mention of a short-leaved variety rather than a formally proposed name. On the same page he used a similar form of expression under *V. brownii*, *V. chrysantha* and *V. chrysostachys*.

Shrub to 70 cm, sometimes taller, without lignotuber, openly branched. Leaves 2-6 mm long, 0.5-0.6 mm wide, slightly thickened upwards. Peduncles 7-11 mm long. Sepals and petals pink. Hypanthium 2 mm long. Sepals 2.5-3.5 mm long; lobes narrow to moderately broad, plumose ± to apex. Petals 2.2-3 mm long.

Distribution and habitat. Widespread from Badgingarra S to Pinjarra, inland to Tammin and S through the Great Southern to Mt Barker, Western Australia (Figure 44). Grows in sand in low-lying, often seasonally damp, heath and open woodland.

Flowering period. October-December.

Conservation status. Not rare or endangered.

Plants of the coastal plain generally have longer, more slender leaves and peduncles than those of northern and inland localities.

Verticordia plumosa var. **incrassata** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae plumosae* foliis brevibus crassis, 1.5-5 mm longis, 0.5-1 mm crassis, et pedunculis 3-8 mm longis, crassis, differt. Hypanthium 1.4-1.5 mm longum. Sepala 3-4 mm longa, lobis 5-7, ad apicem erosis vel subintegris. Petala 2.5-3 mm longa.

Typus: One Mile Rocks [Nature] Reserve, Western Australia, 33° 12' S, 119° 47' E, 12 November 1970, *A.S. George* 10473 (holo: PERTH; iso: CANB).

Shrub without lignotuber, with several irregular spreading stems, to 80 cm tall; internodes of main stems short; lateral branchlets many. Leaves crowded, thickened upwards, obtuse, 1.5-5 mm long, 0.5-1 mm thick, deep green. Peduncles usually 3-8 mm long, thickened upwards. Hypanthium 1.4-1.5 mm long, long-hirsute. Sepals 3-4 mm long; main lobes 5-7, erose to almost entire towards apex. Petals 2.5-3 mm long.

Distribution and habitat. Occurs in the Fitzgerald River National Park from Point Charles and Mt Bland E almost to the Hamersley River, N toward Newdegate and NE to Forrestania and Scaddan, Western Australia (Figure 37). Grows in gravelly clay and sandy loam, in low heath.

Flowering period. Mainly August-November.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *incrassatus* (thickened), in reference to the leaves and pedicels.

A variable taxon that should be studied further. Plants in the Fitzgerald River National Park are more straggling and spreading than those to the NE. The latter have short, very thick leaves.

Differs from *Verticordia plumosa* var. *grandiflora* in the straggling habit, thicker leaves, smaller hypanthium and smaller pink flowers. From Scaddan southwards the variety grades into var. *grandiflora*, the leaves becoming more slender, the peduncles longer, e.g. Truslove, October 1944, *G.E. Brockway* 12 (PERTH). Some collections from the Fitzgerald River National Park show a tendency towards var. *brachyphylla*, e.g. 31 October 1985, *A.S. George* 7089 (PERTH) which has peduncles to 10 mm long.

Verticordia plumosa var. **grandiflora** (Benth.) A.S. George, comb. nov. *Verticordia fontanesii* DC. var. *grandiflora* Benth., Fl. Austral. 3: 21 (1867). *Holotype*: south-western Western Australia, 184-, *J. Drummond* 5: 110 (K; isotype: BM, CGE, E, FI, K, KW, NSW, PERTH, W).

Verticordia pectinata Turcz., Bull. Phys.-Math. Acad. Saint-Petersbourg 10: 327 (1852). *Lectotype* (here chosen): south-western Western Australia, 184-, *J. Drummond* 5: 110 (KW; iso: BM, CGE, E, FI, K - 2 sheets, NSW, PERTH, W).

Typification. The holotype sheet of *V. plumosa* var. *grandiflora* is annotated "var. grandiflora" in Bentham's hand. At KW, where Turczaninow's other types of *Verticordia* are housed, there is a single sheet with three specimens of *V. pectinata* (all from the same gathering). The specimens agree with the protologue, but since the sheet was not annotated by Turczaninow it is here selected as lectotype.

Shrub without lignotuber and 1 or few erect stems, sparsely branched, to 1.3 m tall. Internodes of main branches mostly 10-15 mm apart. Leaves slightly thickened upwards, obtuse, 2-7 mm long, 0.5-0.8 mm wide, medium green. Flowers in rounded groups, ± crowded. Peduncles 5-10 mm long. Hypanthium 2-2.2 mm long, stiffly hirsute. Sepals and petals white or pale pink. Sepals 4-5.5 mm long; main lobes 5 or 6, plumose becoming erose at apex. Petals 3.5-4.5 mm long.

Distribution and habitat. Occurs near the S coast of Western Australia from near the E end of the Porongurup Range to Mt Baring, E of Esperance (Figure 44). Grows in deep sand in heath, often in low-lying places.

Flowering period. September-December.

Conservation status. Not rare or endangered.

Typically distinguished by the white flowers that are larger than those of the other varieties. There is some variation in flower size, sometimes within a population, e.g. near Mt Merivale, 9 November 1985, *A.S. George* 16607 (PERTH) in which sepal length ranges from 3.2-4 mm. A collection from near Mt Maxwell, 6 November 1985, *A.S. George* 16587 (PERTH) has smaller flowers than usual and this population included plants with pale pink flowers.

A variant of *V. plumosa* occurring in the Cape Riche area, represented by *A.S. George* 16500 (PERTH), is intermediate between var. *grandiflora* and var. *plumosa*. The plants are compact in habit, have thick leaves 3-7 mm long, peduncles 4-6 mm long, sepals 3.8 mm long and petals 3.3-3.6 mm long. The petals and androecium are very hairy towards the base.

Verticordia polytricha Benth., Fl. Austral. 3: 25 (1867). *Lectotype* (here chosen): Murchison River, Western Australia, 18--, *A. Oldfield* s.n. (K; isolecto: W - 2 sheets). *Other syntype*: south-western Western Australia, 1850/51, *J. Drummond* 6: 49 (BM, CGE, FI, K, LD, W).

Typification. The two type collections are very similar morphologically. Of the sheets at K seen by Bentham, the Oldfield collection is the better and is selected as lectotype.

Verticordia pritzelii Diels, Bot. Jahrb. Syst. 35: 404 (1904). *Lectotype* (here chosen): Coolgardie Goldfields, Western Australia, October 1901, *E. Pritzel* 876 (L; isolecto: AD, B, BM, E, K, NY, PERTH). *Other syntype*: Gnarlbine, W.A., 12 November 1891, *R. Helms* s.n. (AD-5 sheets, K).

Typification. No type annotated by Diels has survived at B. The sheet at LD selected as lectotype is the only syntype seen that bears a label annotated by Diels. No specimen has been seen of either *Diels* 5568 or *Diels* 5596, both cited in the protologue.

Verticordia pulchella A.S. George, sp. nov.

Ad *Verticordiam mitchellianam* C. Gardner affinis, a qua omnino praeter androecio minore, foliis ramulisque verrucosis, floribus horizontalibus, staminibus staminodiisque pro parte majore conjunctis, praecipue differt. Folia semiteretia, 2-7 mm longa; pedunculi 7-9 mm longi; hypanthium 2-2.5 mm longum, ad basin hirsutum; sepala 5-6 mm longa; petala 3-4 mm longa, fimbriata; stamina 2.6-3.5 mm longa; staminodia 3-3.5 mm longa; stylus 13-15 mm longus.

Typus: Green Road, E of Sandalwood Rock Road, S of Moorine Rock, Western Australia, 31° 42' S, 119° 11' E, 22 October 1984, *A.S. George* 16453 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL, NSW). Figure 28.

Related to *V. mitchelliana*, from which it differs in being altogether smaller except the androecium, and in the warty leaves and branchlets, the horizontal flowers, and the stamens and staminodes united for most of their length. Leaves semiterete, 2-7 mm long. Peduncles 7-9 mm long. Hypanthium 2-2.5 mm long, hirsute towards base. Sepals 5-6 mm long. Petals 3-4 mm long, fimbriate. Stamens 2.6-3.5 mm long; staminodes 3-3.5 mm long. Style 13-15 mm long.

Distribution and habitat. Recorded from several localities in the Mt Hampton area, NE of Narembeen, Western Australia (Figure 36). Grows in sandy loam over granite, in open and tall shrubland.

Flowering period. October-December.

Conservation status. 2RC.

Etymology. From the Latin *pulchellus* (pretty), in reference to the attractive appearance of the plant.

Verticordia pulchella is a distinctive species, related to *V. mitchelliana* but smaller in all respects except the length of the stamens and staminodes. It is a small shrub with spreading or arching

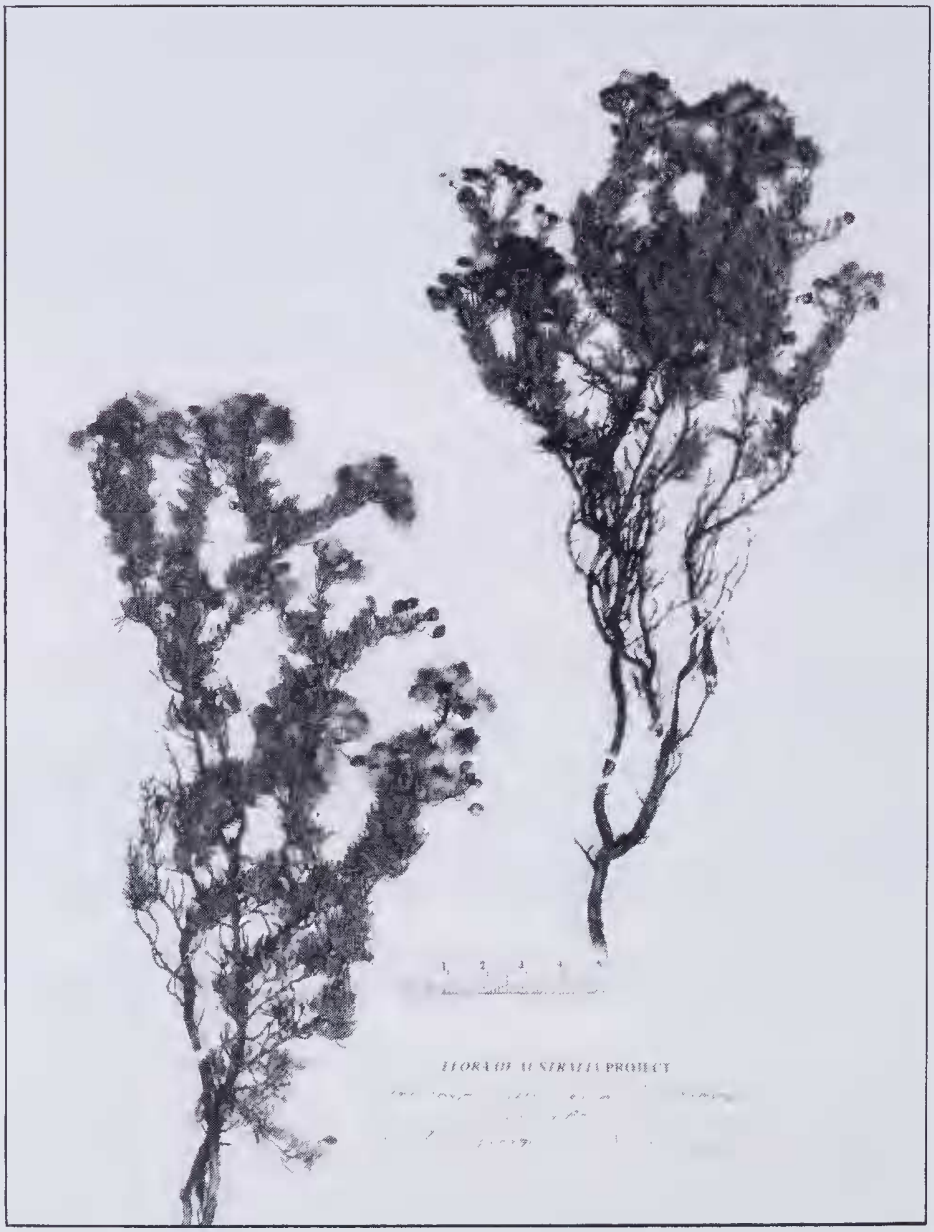

Figure 28. Holotype of *Verticordia pulchella*. Scale in cm.

branches, sometimes in layers. The sepals are red with a green base. The petals are usually deep pink but vary to pale pink and yellow. The style is red. Both branchlets and leaves are somewhat warty, the branchlets with whitish warts, the leaves with raised oil glands.

Verticordia roei Endl., Stirp. Herb. Huegel. 3: 6 [1838] (1939). *Type*: south-western Western Australia, 183-, *J.S. Roe* (holo: W; iso: BM).

Typical *V. roei* is widespread and locally frequent in the south-eastern agricultural region of Western Australia. It is a relatively consistent taxon, varying a little in the length of the stamens and staminodes and in width of the staminodes.

Several scattered populations to the north of typical *V. roei* are somewhat distinct and are worth recognising as a subspecies.

Key to subspecies

Stamens 3-3.8 mm long; staminodes usually 0.2-0.4 mm wide at base, ± acute; style 2.2-3 mm long ..... subsp. *roei*

Stamens 1.8-2.5 mm long; staminodes 0.5 mm wide at base, obtuse; style 1.4-1.9 mm long ..... subsp. *meiogona* A.S. George

Verticordia roei Endl. subsp. **roei**

Corymbose shrub to 1 m, related to *V. insignis* and *V. inclusa* but distinguished especially by the all-cream flowers, long stamens and simple or shortly lobed staminodes. Stamens 3-3.8 mm long; staminodes 0.2-0.4 mm wide at base. Style 2.2-3 mm long; stigma broadly capitate.

Distribution and habitat. Widespread in inland south-western Western Australia, from Southern Cross to Dumbleyung and Peak Charles (Figure 43); grows in sand, sandy loam over gravel, and clay-loam, in heath.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Verticordia roei subsp. **meiogona** A.S. George, subsp. nov.

Ab *Verticordia roei* Endl. subsp. *roei* staminibus brevioribus (1.8-2.5 mm longis), staminodiis latioribus (ad basin 0.5 mm latis), et stylo breviore (1.4-1.9 mm longo), differt.

Typus: Clark Road, N of Bonnie Rock-Burakin road, Western Australia, 30° 16' S, 118° 04' E, 21 October 1984, *A.S. George* 16429 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL, NSW).

Differs from *V. roei* subsp. *roei* in the shorter stamens (1.8-2.5 mm long), broader staminodes (0.5 mm wide towards base) and shorter style (1.4-1.9 mm long).

Distribution and habitat. Recorded only from the type locality, a nearby locality and near Dalwallinu, Western Australia (Figure 36). Grows in sandy loam with some gravel, in low heath.

Flowering period. September-October.

Conservation status. 2E. The subspecies is endangered, occurring only on road verges in an area developed for agriculture.

Etymology. Named from the Greek *meio-* (*meiouros*) (smaller) and *-gone* (*gonimos*) (fruitful, having generative power), in reference to the shorter stamens and style of the subspecies.

The subspecies is distinguished from typical *V. roei* by the shorter stamens and style, and by the broader staminodes that are entire or 1-lobed each side. The flowers are sometimes pink. The subspecies has possibly arisen through hybridisation between typical *V. roei* and *V. inclusa*, although neither species occurs in the area. A single plant among a population of *V. inclusa* SE of Newdegate, 11 October 1981, *E. Berndt* 32, (PERTH) is similar to *V. roei* subsp. *meiogona* but has shorter stamens and style and acute staminodes. The ranges of *V. roei* subsp. *roei* and *V. inclusa* overlap widely. Given the strong winds often experienced in south-western Western Australia, it is feasible for the fruit to have been transported over the distances to the localities where subsp. *meiogona* occurs.

Verticordia rutilastra A.S. George, sp. nov.

Ad *Verticordiam grandifloram* Endl. et *V. nobilem* Meissner affinis, a quibus floribus plerumque minoribus, staminibus minoribus, staminodiis magis fimbriatis, et stylo brevi, differt. Sepala 4.5-5 mm longa; petala 4 mm longa; stamina 0.5-1 mm longa; stylus 0.2 mm longus.

Typus: NE of Mt Lesueur, Western Australia, 30° 10' S, 115° 15' E, 15 October 1984, *A.S. George* 16315 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Closely related to *V. grandiflora* and *V. nobilis*, from both of which it differs in the smaller flowers, smaller staminodes, more fringed staminodes and shorter style. Sepals 4.5-5 mm long. Petals 4 mm long. Stamens 0.5-1 mm long. Style 0.2 mm long.

Distribution and habitat. Occurs from the Mt Lesueur area NE to Alexander Morrison National Park and SE to Koonah Road, SSE of Badgingarra, Western Australia (Figure 41). Grows in sand over laterite or sandstone, in heath and open mallee-heath.

Flowering period. October-mid November.

Conservation status. 2RC.

Etymology. Named from the Latin *rutilus* (red with a metallic lustre) and *aster* (a star), in reference to the appearance of the flower as it ages and turns red; the petals change first and together appear star-like.

The species is related to *V. grandiflora* and *V. nobilis* in having a bifurcate anther appendage but can be distinguished by its smaller flowers, short stamens and staminodes (the latter fimbriate with more cilia than in the other two species), and the very short style. After anthesis the staminodes usually curve inward over the stamens.

Verticordia serotina A.S. George, sp. nov.

Ad *Verticordiam forrestii* F. Muell. arcte affinis, a qua foliis et floribus majoribus, et florescentia serotina, differt. Folia 4-6 mm longa; hypanthium 5 mm longum; sepala 8-9 mm longa, 13-14 mm lata; petala 6 mm longa, 4-5 mm lata; stamina 3-3.5 mm longa; stylus 8 mm longus.

Typus: SW of Learmonth, Cape Range, Western Australia, 22° 16' S, 113° 54' E, 5 September 1970, *A.S. George* 10285 (holo: PERTH; iso: CANB, K, MEL).

Closely related to *V. forrestii*, from which it differs in the larger leaves and flowers and the later flowering period. Leaves 4-6 mm long. Hypanthium 5 mm long. Sepals 8-9 mm long, 13-14 mm wide. Petals 6 mm long, 4-5 mm wide. Stamens 3-3.5 mm long. Style 8 mm long.

Distribution and habitat. Occurs in the southern part of the Cape Range, Cape Range National Park, north-western Western Australia (Figure 46). Grows on red sand dunes in open shrubland.

Flowering period. September.

Conservation status. 2RC.

Etymology. Named from the Latin *serotinus* (late), in reference to the flowering period being later than that of the closely related *V. forrestii*.

This species is clearly related to *V. forrestii* which is widespread in north-western Western Australia. *V. serotina* has larger leaves and flowers, the latter being a deeper pink than those of *V. forrestii*. Both species were present on the same dune at the type locality; *V. forrestii* had almost finished flowering, but *V. serotina* was just beginning.

Verticordia serrata (Lindley) Schauer, November Act. Nat. Cur. 19 suppl. 2: 222 (1841). - *Chrysorhoe serrata* Lindley, Sketch Veg. Swan River vi (1839). *Type*: Swan River, Western Australia, 183-, *J. Drummond* s.n. (holo: CGE).

Typification. Since there is only one collection on the sheet at CGE annotated by Lindley it is taken as the holotype. The locality Swan River, cited for many collections at that period, indicates only the south-western corner of Western Australia. *V. serrata* is a variable species, and the form represented by the type occurs in southern inland districts.

Bentham (1867) recognised the variation in *V. serrata* but stopped short of formal names, citing the collections seen under four forms, a-d. Two of these, a and d, are here placed in typical *V. serrata*. In the present treatment three varieties are recognised, two described as new.

Key to varieties

1a Stem leaves linear, acute ..... var. *linearis* A.S. George

1b Stem leaves elliptic to obovate, obtuse

2a Leaf cilia usually 0.2-0.5 mm long; lowest peduncles 3-12 mm long; long stamens 3 mm long; style 2-2.8 mm long ..... var. *serrata*

2b Leaf cilia usually 0.5-2 mm long; lowest peduncles 12-18 mm long; long stamens 3.5-4 mm long; style 3-4 mm long ..... var. *ciliata* A.S. George

Verticordia serrata (Lindley) Schauer var. **serrata**

Distribution and habitat. Extends from Pingelly to Chillinup (S of Ongerup) and E to Hyden and Fitzgerald, Western Australia, with several records NE to Lake Brown (Figure 45). Grows in sand and sandy loam in heath and mallee heath.

Flowering period. October-November.

Conservation status. Not rare or endangered.

Verticordia serrata var. *serrata* usually has smaller leaves and flowers than the two other varieties. It varies considerably in the morphology of all parts. Typically the stem and floral leaves are obovate, 2.5-3 mm long, with cilia to 0.3 mm long. The lowest peduncles are c. 9 mm long. The sepals are 3 mm long; petals 2.5-3 mm long and c. 1.5 mm wide with teeth to 1 mm long. The stamens are 4 mm long, the anther 0.3 mm long with an appendage 0.2 mm long.

Notable variants are: 29 km S of Ongerup, 2 November 1982, *N. Stevens* 20, and 16 km S of Boddington, 8 September 1980, *D. Halford* 801014 - petals orbicular, 2 mm diam.; N of Lake Brown, December 1943, *G.E. Brockway* - leaf cilia to 0.8 mm, lowest peduncles to 12 mm; Bokal, 3 October 1985, *V. Crowley* 11 - leaves to 2 mm long, with a few cilia to 0.1 mm; sepals 2 mm long; petals 2 mm long, 1 mm wide, obscurely serrate; stamens 2.5 mm long (all collections at PERTH).

Verticordia serrata (Lindley) Schauer var. **ciliata** A.S. George, var. nov.

Ab *Verticordia serrata* var. *serrata* foliorum ciliis longioribus (0.5-2 mm longis), pedunculis longioribus (infimis 12-18 mm longis), et sepalorum fimbriis reflexis prominentioribus, praecipue differt.

Typus: W of Carnamah on Eneabba road, Western Australia, 29° 48' S, 115° 40' E, 17 October 1984, *A.S. George* 16352 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Differs from *V. serrata* var. *serrata* especially in the longer (0.5-2 mm) cilia of the leaves, longer peduncles (the lowest 12-18 mm long) and the more prominent reflexed fimbriae of the sepals.

Distribution and habitat. Widespread in south-western Western Australia from near Carnamah to York and E to Cadoux and Tammin; also recorded N of Bendering (Figure 45). Grows in sand and gravelly sand, in heath and open woodland.

Flowering period. Late September-late November.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *ciliatus* (ciliate), in reference to the prominent cilia of the leaf margins.

This is Bentham's form c. (Fl. Austral. 3: 23). The longer leaf cilia, peduncles, stamens and style usually distinguish it from var. *serrata*. In the central wheatbelt there is some intergradation, e.g. W of Koonadgin Siding, 16 November 1983, *M. Smith* 92 (PERTH).

Verticordia serrata (Lindley) Schauer var. **linearis** A.S. George, var. nov.

Ab varictatibus aliis *Verticordiae serratae* foliis linearibus acuminatis praecipue differt. Folia 6-20 mm longa, ciliis ad 1.2 mm longis saepe non nisi in dimidio infero. Pedunculi infimi c. 12 mm longi.

Typus: N of Bullsbrook, Geraldton Highway [now Great Northern Highway], Western Australia, c. 31° 34' S, 115° 59' E, 29 September 1968, *M.E. Phillips* CBG 030101 (holo: PERTH; iso: CBG).

Differs from the other varieties of *V. serrata* especially in the linear acuminate leaves. Leaves 6-20 mm long, with marginal cilia to 1.2 mm long often only in the lower half. Lowest peduncles c. 12 mm long.

Distribution and habitat. Occurs c. 55-60 km N of Perth in the Muchea district, Western Australia (Figure 45). Grows in gravelly sand, in eucalypt open woodland.

Flowering period. Late September-October.

Conservation status. 2E.

Etymology. Named from the Latin *linearis* (linear), in reference to the leaves.

This is Bentham's form b (loc. cit.). Several collections from the Bindoon-Toodyay area to the north are intermediate between var. *linearis* and var. *ciliata*. e.g. between Toodyay and Bindoon, 2 Oct. 1947, *C.A. Gardner* s.n. (PERTH).

Verticordia sieberi Diesing ex Schauer, Nov. Act. Cur. 19: suppl. 2: 201 (1841).

Typification. The holotype of this name is a sheet at W labelled King George Sound with the annotation by Schauer: "[Diesing msc.] Nomen recepi, sed haec species a DC. quantum scio

nusquam est descripta'', i.e. '' [Diesing in manuscript] I received the name but as far as I know this species has nowhere been described by de Candolle''. The locality appears an error, since the type represents the variant that occurs from Esperance to Cape Arid. The collector is unknown but may have been Robert Brown. Franz Sieber, after whom the species is named, did not visit south-western Australia.

Verticordia sieberi is distinguished from *V. plumosa* especially by the narrow midribs and deeper fringing of the sepal lobes, and from *V. stenopetala* by the shorter, usually orbicular petals and shorter style. These three species are very closely related. *Verticordia sieberi* shows considerable variation, here recognised as four varieties, but further study is needed.

Key to varieties

1a Sepals 1.5-1.7 mm long; hypanthium 1-1.5 mm long ..... var. *curta* A.S. George

1b Sepals 1.9-3 mm long; hypanthium 1.8-2 mm long

2a Petals entire to erose ..... var. *sieberi*

2b Petals fimbriate

3a Leaves less than 1 mm wide; style 5 mm long ..... var. *lomata* A.S. George

3b Leaves 1.5-2 mm wide; style 4 mm long ..... var. *pachyphylla* A.S. George

Verticordia sieberi Diesing ex Schauer var. **sieberi**

Petals entire or obscurely erose.

Distribution. Occurs from near Hopetoun to Cape Arid, Western Australia.

Verticordia sieberi var. **lomata** A.S. George, var. nov.

Ab *Verticordia sieberi* var. *sieberi* petalis fimbriatis, et ab var. *pachyphylla* foliis tenuioribus, differt.

Type: E of Hamersley River crossing on old telegraph line track, [Fitzgerald River National Park], Western Australia, c. 33° 56' S, 119° 56' E, 8 March 1970, *A.S. George* 9837 (holo: PERTH; iso: CANB, K, MEL, NSW).

Differs from *V. sieberi* var. *sieberi* in the fimbriate petals, and from var. *pachyphylla* in the more slender leaves and longer style.

Distribution and habitat. Occurs from near the eastern end of the Porongurup Range to Munglinup, Western Australia (Figure 45). Grows in deep white sand and sand over laterite, in shrubland.

Flowering period. Mainly January-April.

Conservation status. Not rare or endangered.

Etymology. Named from the Greek *loma* (a fringe or border), in reference to the petal margin.

The variety is distinguished from typical *V. sieberi* by the shortly fimbriate petal margin. The feature is consistent in most collections from Munglinup westwards. In some western populations the plants are very slender.

Verticordia sieberi Diesing ex Schauer var. **pachyphylla** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae sieberi* Diesing ex Schauer foliis latioribus (1.5-2 mm latis) crassis, et stylo breviore (4 mm longo) differt. Petala fimbriata.

Typus: ENE of Lake King, Frank Hann National Park, Western Australia, 32° 55' S, 120° 19' E, 21 January 1985, *K. Newbey* 10898 (holo: PERTH; iso: AD, CANB, K, MEL, NSW, PERTH).

Differs from the other varieties of *V. sieberi* in the broader thick leaves (1.5-2 mm wide) and the shorter style (4 mm long). Petals fimbriate.

Distribution and habitat. Known only from the type (Figure 45). Described as 'frequent in patches in *Darwinia diosmoides* low shrubland. Well-drained, slightly saline, aeolian loamy sand . . inner slope of salt lake.'

Flowering period. In full flower in January.

Conservation status. 1VC. The variety probably occurs around other salt lakes in the region.

Etymology. The varietal epithet is derived from the Greek *pachys* (thick) and *phyllon* (a leaf), in reference to the very broad, thick leaves.

The very broad, thick leaves distinguish *Verticordia sieberi* var. *pachyphylla* from var. *sieberi* and var. *lomata*. The peduncles are also very thick and 1-3 mm long, shorter than those in most collections of the other varieties. The sepals are 2.8-3 mm long. The flowers are very pale pink fading to white.

Verticordia sieberi var. **curta** A.S. George, var. nov.

Ab varietatibus aliis *Verticordiae sieberi* sepalis brevioribus (1.5-1.7 mm longis) et hypanthio minore (1-1.5 mm longo), differt. Petala erosa ad breviter serrata.

Type: between Newdegate and Lake King, c. 33° 07' S, 119°21' E, 9 December 1985, *R. Cugley* 20 (holo: PERTH; iso: CANB, MEL).

Differs from the other varieties of *V. sieberi* in the shorter sepals (1.5-1.7 mm long) and the smaller hypanthium (1-1.5 mm long). Petals erose to shortly serrate.

Distribution and habitat. Occurs to the west and east of Lake King, Western Australia (Figure 45). Grows in and over laterite, in heath with open mallee eucalypts.

Flowering period. December-February.

Conservation status. 2R.

Etymology. Named from the Latin *curtus* (short), in reference to the sepals.

The small hypanthium and short sepals result in the petals dominating the flower.

Verticordia spicata F. Muell., Fragm. 1: 226 (1859). *Lectotype* (here chosen): towards Murchison River, Western Australia, 18--, *A. Oldfield* s.n. (K; isolecto: BM).

Typification. No sheet of this collection has been found at MEL, where most of Mueller's types are housed.

Verticordia spicata is characterised in *Verticordia* sect. *Verticordella* by the small closely imbricate ovate-elliptic leaves with prominent oil glands and narrow ciliate margins, crowded sessile or almost sessile flowers, a honeycombed obscurely ribbed hypanthium, sepals 3-5.5 mm long with slender auricles, petals 2-5 mm long with scabrid fringe 1-2 mm long, and a slender straight exserted style 4-9 mm long with a beard 1-1.5 mm long of hairs 0.3-0.4 mm long. The reflexed appendages are usually almost as long as the hypanthium.

Typical *V. spicata* occurs in Kalbarri National Park, extending N towards Cooloomia and SE towards Northampton and Yuna (Figure 41). There is one record near Mullewa. The subspecies is somewhat variable in size and flower colour.

A second subspecies occurs between Arrino and Morawa, distinguished by its smaller leaves and flowers.

Key to subspecies

Style 6.5-9 mm long; sepals 5-5.5 mm long; petals 4-4.5 mm long, the lamina 2 mm wide; leaves mostly 2-3.5 mm long ..... subsp. *spicata*

Style 4 mm long; sepals 3-4 mm long; petals 3 mm long, the lamina 1.5 mm wide; leaves mostly 1.5-2 mm long ..... subsp. *squamosa* A.S. George

Verticordia spicata subsp. **squamosa** A.S. George, subsp. nov.

Ab *Verticordia spicata* subsp. *spicata* foliis et floribus minoribus differt. Folia plerumque 1.5-2 mm longa, erosa ad brevissime ciliata. Sepala 3.5 mm longa. Petala 2.5 mm longa. Stylus 4 mm longus.

Typus: E of Three Springs-Morawa road along Simpson Road, Western Australia, c. 29° 24' S, 115° 50' E, 30 December 1981, *C. Chapman* 42 (holo: PERTH; iso: CANB, K). Figure 29.

Differs from *V. spicata* subsp. *spicata* in the smaller leaves and flowers. Leaves usually 1.5-2 mm long, erose to shortly ciliate. Sepals 3.5 mm long. Petals 2.5 mm long. Style 4 mm long.

Distribution and habitat. Known from six collections, one without locality, the others from the area between Three Springs and Morawa, Western Australia (Figure 41). Grows in deep yellow sand, in tall shrubland.

Flowering period. November-December.

Conservation status. 2E. The subspecies is recorded only from road verges in a heavily cleared area.

Etymology. The subspecific epithet (Latin, *squamosus*, scaly), refers to the small appressed, imbricate leaves.

At the type locality, *Verticordia spicata* subsp. *squamosa* grows with *V. comosa* and appears to hybridise with that species. A representative collection of a presumed hybrid is *Chapman* 58A (PERTH) which has somewhat spreading leaves mostly 2-3 mm long with prominent oil glands, a honeycombed hypanthium with reflexed appendages c. half as long, sepals 3.5 mm long with prominent (but not peltate) auricles, stiffly fringed sepal lobes, petals 3 mm long with small auricles, and a style 5 mm long with a more dense beard than subsp. *squamosa*. The staminodes are slightly flattened and obscurely lobed below the apex. *Chapman* 47 (PERTH) has almost appressed leaves, similar flowers but with larger sepal auricles and the style beard of crowded hairs to 0.5 mm long; the flowers were described as "off-white".

Verticordia staminosa C. Gardner & A.S. George, J. Roy. Soc. W. Australia 46: 132 (1963). *Type*: Wongan Hills, Western Australia, 12 June 1961, *W.H. Butler* s.n. (holo: PERTH; syn: K, MEL).

Typical *V. staminosa* is still known from only one locality near Wongan Hills. Records attributed to the species from the Newdegate - Lake Grace area are here described as a new subspecies with two varieties.

Key to subspecies and varieties

1a Stamens 9-12 mm long, united for 2-3 mm; staminodes inserted on outside of tube, the free part c. 1.5 mm long, subulate; sepals 7 mm long ..... subsp. *staminosa*

1b Stamens 6-7.5 mm long, united for 3 mm; staminodes inserted between stamens, the free part 1 mm long, obtuse; sepals 5-6 mm long ..... subsp. *cylindracea* A.S. George

2a Shrub with widely spreading branches..... var. *cylindracea*

2b Shrub erect, pine-like ..... var. *erecta* A.S. George

Figure 29. Holotype of *Verticordia spicata* subsp. *squamosa*. Scale in cm.

Verticordia staminosa C. Gardner & A.S. George subsp. **staminosa**

Shrub with widely spreading branches, to 30 cm tall. Sepals 7 mm long. Stamens 9-12 mm long, united for 2-3 mm; staminodes subulate, inserted on outside of staminal tube, the free part c. 1.5 mm long.

Distribution and habitat. Recorded only near Wongan Hills, Western Australia. Grows on exposed granitic slopes.

Flowering period. June-October.

Conservation status. 2E.

Verticordia staminosa subsp. **cylindracea** A.S. George, subsp. nov.

Ab *Verticordia staminosa* subsp. *staminosa* floribus minoribus, tubo staminali longiore et staminodiis inter stamina insertis, differt. Sepala 5-6 mm longa. Stamina 6-7.5 mm longa. Staminodia c. 1 mm longa, obtusa.

Typus: near Pingaring, Western Australia, 32° 45' S, 118° 39' E, 23 October 1984, *A.S. George* 16464 & *E.A. Berndt* (holo: PERTH; iso: AD, CANB, K, MEL, NSW).

Differs from *V. staminosa* subsp. *staminosa* in the smaller flowers, the longer staminal tube, and the staminodes inserted between the staminal filaments. Sepals 5-6 mm long. Stamens 6-7 mm long. Staminodes c. 1 mm long, obtuse.

Distribution and habitat. Occurs on granitic hills from Pingaring to E of Newdegate, Western Australia.

The smaller flowers, shorter stamens but united for half their length, and the staminode insertion between the stamens, distinguish this subspecies from subsp. *staminosa*.

Etymology. From the Latin *cylindraceus* (cylindrical), in reference to the androecium.

There are two varieties distinguished by their habit.

Verticordia staminosa subsp. **cylindracea** A.S. George var. **cylindracea**

Shrub with widely spreading branches.

Distribution and habitat. Occurs on several granitic outcrops from Pingaring to E of Newdegate, Western Australia (Figure 36).

Flowering period. July-October.

Conservation status. 2R.

Verticordia staminosa subsp. **cylindracea** var. **erecta** A.S. George, var. nov.

Ab *Verticordia staminosa* var. *cylindracea* habitu erecto ad 1 m alto differt.

Typus: NW of Newdegate, Western Australia, c. 32° 58' S, 118° 49' E, 23 October 1984, *A.S. George* 16466 & *E.A. Berndt* (holo: PERTH; iso: CANB, K, MEL).

Differs from *V. staminosa* var. *cylindracea* in the erect habit (to 1 m tall).

Distribution and habitat. Recorded only from the type locality which is on a farm (Figure 36). Grows in coarse soil on a granitic hill, with *Borya*.

Flowering period. July-October.

Conservation status. 2E. The population is on freehold land and is protected by the owners.

Etymology. Named from the Latin *erectus*, in reference to the habit.

The erect, pine-like growth, consistent in the population, distinguishes this from *V. staminosa* var. *cylindracea*, with which it shares the same floral characters that separate the subspecies from subsp. *staminosa*.

Verticordia stenopetala Diels, Bot. Jahrb. Syst. 35: 402 (1904). *Type*: near Bronti, Coolgardie District, Western Australia, November 1901, *L. Diels* 6105; not found. *Neotype* (here nominated): SE of Moorine Rock, Western Australia, 31° 26' S, 119° 15' E, 22 October 1984, *A.S. George* 16438 & *E.A. Berndt* (PERTH; isoneo: B, CANB, K, MEL).

Typification. No specimen of Diels' collection has been found among the material of *Verticordia* in some 20 herbaria, including the Botanisches Museum Berlin-Dahlem (B) where his main set was lodged. The type is therefore presumed lost and the above neotype is here nominated. The neotype agrees well with the protologue except that the petals are c. 3.5 mm long and 1.5-2 mm wide. The length of the peduncle was given as 6 cm by Diels, an error for 6 mm.

Verticordia subulata A.S. George, sp. nov.

Ad *Verticordiam acerosam* Lindley affinis, a qua sepalis densiore fimbriatis, staminodiis teretibus subulatis et stylo brevi (0.5-1 mm longo), praecipue differt.

Typus: Salt River road, W of Borden-Albany road, Stirling Range National Park, Western Australia, 34° 18' S, 118° 01' E, 26 October 1984, *A.S. George* 16523 & *E.A. Berndt* (holo: PERTH; iso: CANB, K).

Closely related to *V. acerosa*, from which it differs especially in the more densely fimbriate sepals, the terete subulate staminodes and the short style (0.5-0.7 mm long).

Distribution and habitat. Occurs from the Cranbrook-Tambellup area SE through the Stirling Range to South Stirling and Wellstead, Western Australia (Figure 36). Grows in clay and sandy loam, sometimes over laterite, in eucalypt woodland and mallee shrubland.

Flowering period. September-October.

Conservation status. Not rare or endangered.

Etymology. Named from the Latin *subulatus* (narrow with a fine point), in reference to the staminodes.

Verticordia subulata is related to *V. acerosa* and less closely to *V. endlicheriana*, being distinguished especially by the subulate staminodes and short style. The floral leaves are usually very broad and the sepals more densely fimbriate than in *V. acerosa* and *V. endlicheriana*. The flowers have no scent, while those of *V. acerosa* and *V. endlicheriana* have a typical *Verticordia* scent; they turn deep red with age. Some collections, mainly from the eastern parts of the species' range, have staminodes with a small lobe on one or both sides.

Verticordia tumida A.S. George, sp. nov.

Ab speciebus aliis *Verticordiae* sect. *Verticordellae* hypanthio latiore, appendiculis tumidis, stylo breviore et ovulis plus numerosis, praecipue differt. Folia elliptica, obovata vel oblonga, crassa, obtusa sed breviter mucronata, 1-3 mm longa, ± patentia, cinereo-viridia. Flores turmis parvis. Pedunculi 2-3 mm longi. Hypanthium 2.5-3.5 mm longum, 2.5-4 mm latum, rotundato-costatum; appendiculi reflexi incrassati, 1-1.8 mm longi, obtusi. Sepala 5-6 mm longa, lobis 5-10, ciliis reflexis vel ± auriculatis. Petala 5-5.5 mm longa; fimbria 1.8-2.5 mm longa, grosse serrata vel integra, scabrida. Stamina 2.1-3 mm longa; staminodia 1.5-1.8 mm longa. Stylus 3.5-4 mm longus, ad apicem curvatus; pili barbae 0.6-0.8 mm longi. Ovuli 8-10.

Typus: Tammin, Western Australia, 26 November 1953, *C.A. Gardner* 12108 (holo: PERTH; iso: CANB, PERTH).

Differs from the other species of *Verticordia* sect. *Verticordella* especially in the broader hypanthium with swollen reflexed appendages, the shorter style and the more numerous ovules. Leaves elliptic, obovate or oblong, thick, obtuse but shortly mucronate, 1-3 mm long, ± spreading, grey-green. Flower groups small. Peduncles 2-3 mm long. Hypanthium 2.5-3.5 mm long, 2.5-4 mm wide, rounded-ribbed; reflexed appendages thickened, 1-1.8 mm long, obtuse. Sepals 5-6 mm long, with 5-10 lobes, ± auriculate with reflexed cilia. Petals 5-5.5 mm long; fimbriae 1.8-2.5 mm long, coarsely serrate or entire, scabrid. Stamens 2.1-3 mm long; staminodes 1.5-1.8 mm long. Style 3.5-4 mm long, curved towards apex; beard hairs 0.6-0.8 mm long. Ovules 8-10.

Distribution. Widespread in inland south-western Western Australia from Dowerin to Wickepin and east to Peak Charles and East Mt Barren.

Figure 30. Holotype of *Verticordia tumida* subsp. *therogana*. Scale in cm.

Etymology. Named from the Latin *tumidus* (swollen), in reference especially to the reflexed appendages of the hypanthium.

The broad hypanthium with rounded ribs and large swollen appendages and the 8-10 ovules particularly distinguish this species within sect. *Verticordella*. The flowers are large and bright pink, usually continuing throughout summer. There are 2 subspecies.

Key to subspecies

Hypanthium constricted towards base, prominently angular;
sepal lobes 9 or 10, the reflexed cilia few; petal fringe coarse,
the segments ± serrate towards base ..... subsp. *tumida*

Hypanthium not constricted towards base, obscurely ribbed;
sepal lobes 5-8, the reflexed cilia numerous and often auriculate;
petal fringe not or very sparsely serrate ..... subsp. *therogana* A.S. George

Verticordia tumida A.S. George subsp. **tumida**

Hypanthium somewhat constricted and angular below appendages; appendages 1.5-1.8 mm long; sepal lobes 9 or 10, the reflexed cilia few. Petal fringe usually ± serrate towards base.

Distribution and habitat. Occurs mainly between Dowerin and Charles Gardner National Park, with outliers E to Bronti and S to Jitarning (Figure 40). Grows in sand, rarely in laterite, in heath.

Flowering period. Late October-April.

Conservation status. Not rare or endangered.

Verticordia tumida subsp. **therogana** A.S. George, subsp. nov.

Ab *Verticordia tumida* subsp. *tumida* ciliis reflexis sepalorum plus numerosis, hypanthio ad basin minus anguloso appendiculis 1-1.3 mm longis, sepalorum lobis 5-8, petalorum fimbriis integris gracilioribus, praecipue differt.

Typus: N of Hyden on Mt Walker South Road, Western Australia, 30° 09' S, 118° 43' E, 22 November 1985, *D.B. Foreman* 1161 (holo: PERTH; iso: AD, CANB, MEL). Figure 30.

Differs from subsp. *tumida* especially in the more numerous reflexed cilia of the sepals, the hypanthium less angular towards the base and with reflexed appendages 1-1.3 mm long, the sepal lobes 5-8, and the fimbriae of the petals simple and more slender.

Distribution and habitat. Widespread in the southern agricultural regions of Western Australia, from Wickepin to Peak Charles and S to East Mt Barren (Figure 40). Grows in sand, sandy loam, gravelly sand and quartzitic sand, in heath and mallee shrubland.

Flowering period. Late October-March, but recorded as late as May.

Conservation status. Not rare or endangered.

Etymology. From the Greek *theros* (summer) and *ganos* (brightness); the subspecies usually flowers throughout summer and has bright pink flowers.

This subspecies is variable and should be studied in more detail. The reflexed cilia of the sepals are sometimes few, as in subsp. *tumida*. The petal fringe varies from fine and smooth to coarse and scabrid, sometimes with a few teeth but not as serrate as in subsp. *tumida*. Collections from the Wickepin area, e.g. *D.B. Foreman* 1108 (CANB, MEL, PERTH), are morphologically closest to subsp. *tumida*.

Verticordia venusta A.S. George, sp. nov.

Ad *Verticordiam muellerianam* E.Pritzel affinis, a qua foliis minoribus, floribus roseis, stylo breviore minus curvato pilis brevioribus, differt. Folia obovata-elliptica, plerumque 2-4 mm longa, 1.5-3.5 mm lata. Stylus 5 mm longus, pilis 0.2-0.3 mm longis.

Typus: by railway, S of Manmanning, Western Australia, 30° 55' S, 117° 06' E, 28 November 1983, *B.H. Smith* 318 (holo: PERTH; iso: AD, CANB, HO, MEL).

Related to *V. muelleriana*, from which it differs in the smaller leaves, pink flowers, and shorter less curved style with shorter beard hairs. Leaves obovate-elliptic, usually 2-4 mm long, 1.5-3.5 mm wide. Style 5 mm long, with hairs to 0.2-0.3 mm long.

Distribution and habitat. Widespread in NE agricultural areas of Western Australia, from Perenjori to Wongan Hills and E to Bencubbin (Figure 41). Grows in yellow sand and occasionally in gravelly sand, in heath and shrubland.

Flowering period. Late October-January.

Etymology. From the Latin *venustus* (charming, lovely), in reference to the appearance of the plant in flower.

This species has long been considered a variant of *V. muelleriana* but may be distinguished from that species especially by the smaller leaves and the less-curved style with a beard of shorter hairs. Usually the flowers are rose-pink in contrast with the maroon of *V. muelleriana*. One collection, NNW of Wubin, 20 October 1984, *A.S.George* 16419 (PERTH), has leaves to 5 mm long and 4 mm wide.

Verticordia verticordina (F. Muell.) A.S. George, comb. nov.

Chamelaucium verticordinum F. Muell., Fragm. 4: 57 (1864); *Darwinia verticordina* (F. Muell.) Benth., J. Linn. Soc., Bot. 9: 181 (1865). *Type*: towards Cape le Grand, 18--, *G. Maxwell* s.n.; n.v.

The taxonomic position of this species has been a problem for many years, since it lay uneasily in either *Darwinia* or *Chamelaucium*. Both Mueller and Bentham considered it to have some characters of *Verticordia*, yet largely because of the scarcely divided sepals it was not included in this genus. The overall morphology is, in fact, very similar to that of *Verticordia* sect. *Infuscata*, especially the habit, leaves, hypanthium, androecium, style and ovary. The sepals, being unlobed but erose to lacerated, are certainly atypical in *Verticordia*, but they have the thin scarious margins of many species, unlike the thick texture in *Chamelaucium*. Very shortly divided sepals also occur in *V. cooloomia* and *V. lepidophylla* var. *quantula*. The long style, noted by Bentham as 'rare in Verticordia', occurs in a number of species discovered since he wrote the account for "Flora Australiensis". The species also has 2 ovules, in contrast to the 6-10 ovules found in all species of *Chamelaucium*. *Darwinia* is now restricted to taxa with a multiple-flowered inflorescence (N.G. Marchant pers. comm.). Because of the almost entire sepals *V. verticordina* is placed in its own section, *Elachoschista* (see above).

Verticordia vicinella A.S. George, sp. nov.

Ad *Verticordiam minutifloram* F. Muell. affinis, a qua ramulis florentibus magis corymbiformibus, floribus plerumque rosaceis vel lilacinis, raro luteolis, sepalorum divisionibus tenuioribus, petalis pubescentibus, staminibus majoribus (c. 0.5 mm longis), staminodiis majoribus (c. 0.5 mm longis) glandulosis, et barba styli pro parte majore extensa, differt.

Typus: near Arboretum, Esperance, Western Australia, March 1988, *T. Daniell* s.n. (holo: PERTH; iso: CANB, K, MEL).

Related to *V. minutiflora*, from which it differs in the more corymiform floral branchlets, the usually pink or lilac flowers, rarely yellowish, the more slender divisions of the sepals, the pubescent petals, the larger stamens (c. 0.5 mm long), the larger (c. 0.5 mm long) glandular staminodes, and the style beard extending for a longer distance.

Distribution and habitat. Occurs mainly from Esperance to Mt Ragged, Western Australia, with a record from the rabbit-proof fence S of the Ravensthorpe-Esperance Highway (Figure 33). Grows in sand, often low-lying, in heath.

Flowering period. January-April.

Conservation status. 3RC.

Etymology. Named from the Latin *vicinus* (neighbouring) with the diminutive suffix *-ella*, in reference to the small flowers and close relationship with *V. minutiflora*.

Figure 31. Holotype of *Verticordia wonganensis*. Scale in cm.

This species is closely related to *V. minutiflora* but usually has pink or lilac flowers, more numerous sepal divisions, slender, pubescent petals, larger stamens and staminodes, and the beard extending over a longer portion of the style. The habit, especially that of the flowering branchlets, is more corymb-like. The species also grows in a different habitat, *V. minutiflora* usually being on granitic slopes.

Verticordia wonganensis A.S. George, sp. nov.

Ad *Verticordiam drummondii* Schauer arcte affinis, a qua floribus majoribus sed stylo breviore, laete roseis, et florescentia praecoci, praecipue differt. Pedunculi 1-1.5 mm longi. Hypanthium 2.5 mm longum, costatum, appendiculis reflexis 1.5 mm longis acutis. Sepala 5-6 mm longa, lobis 7 vel 8, non auriculata. Petala 5-6 mm longa, fimbriis 10-12 c. 2 mm longis inclusa. Stamina 2 mm longa; staminodia 1.6 mm longa. Stylus 4-5 mm longus, ad apicem curvatus; pili barbae 0.4 mm longi. Ovula 6.

Typus: Wongan Hills Flora Reserve, Western Australia, c. 30° 52' S, 116° 43' E, 21 November 1961, *R.D. Royce* 6734 (holo: PERTH). Figure 31.

Closely related to *V. drummondii*, from which it differs especially in the larger pale pink flowers but with shorter style, and the earlier flowering period. Peduncles 1-1.5 mm long. Hypanthium 2.5 mm long, ribbed, with acute reflexed appendages 1.5 mm long. Sepals 5-6 mm long, with 7 or 8 lobes, not auriculate. Petals 5-6 mm long, including 10-12 fimbriae c. 2 mm long. Stamens 2 mm long; staminodes 1.6 mm long. Style 4-5 mm long, curved towards apex; beard hairs to 0.4 mm long. Ovules 6.

Distribution and habitat. Restricted to a few localities N and NE of Wongan Hills, Western Australia (Figure 37). Grows in yellow and white sand, rarely in gravelly sand, in shrubland.

Flowering period. November-December.

Conservation status. 2RC.

Etymology. Named after Wongan Hills, the town near the area of distribution.

Taken in the context of the other taxa now recognised in *Verticordia* sect. *Verticordella*, this is worthy of specific rank. It is closest to *V. drummondii* but differs as outlined in the diagnosis.

Acknowledgements

My interest in *Verticordia* goes back to my early years at the Western Australian Herbarium (PERTH). The Curator at that time, Bob Royce, and his successor John Green, encouraged my research. Paul G. Wilson, Senior Botanist at PERTH since 1964, has always been ready to assist in various ways. Since I left PERTH, the technical assistants there have readily processed loans of specimens to and from Canberra.

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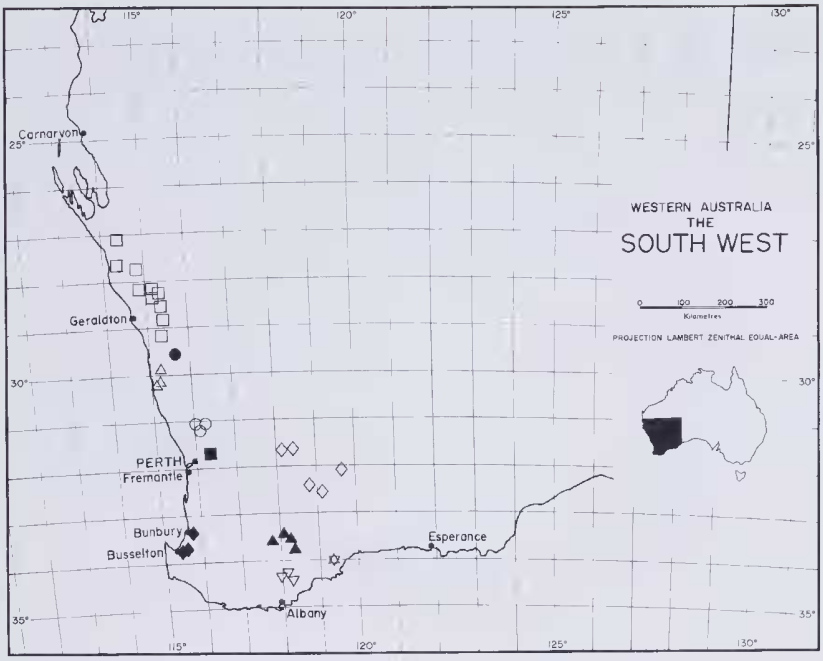

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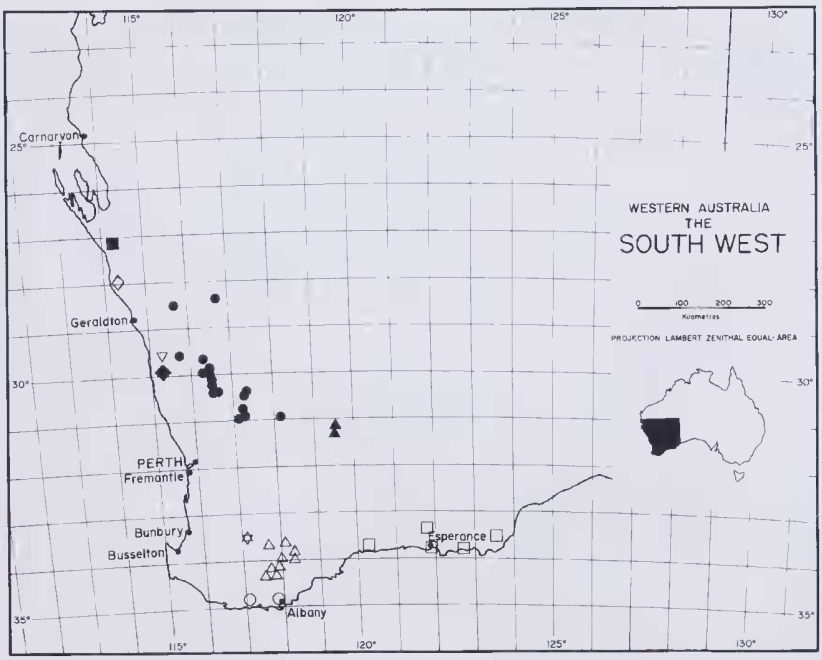

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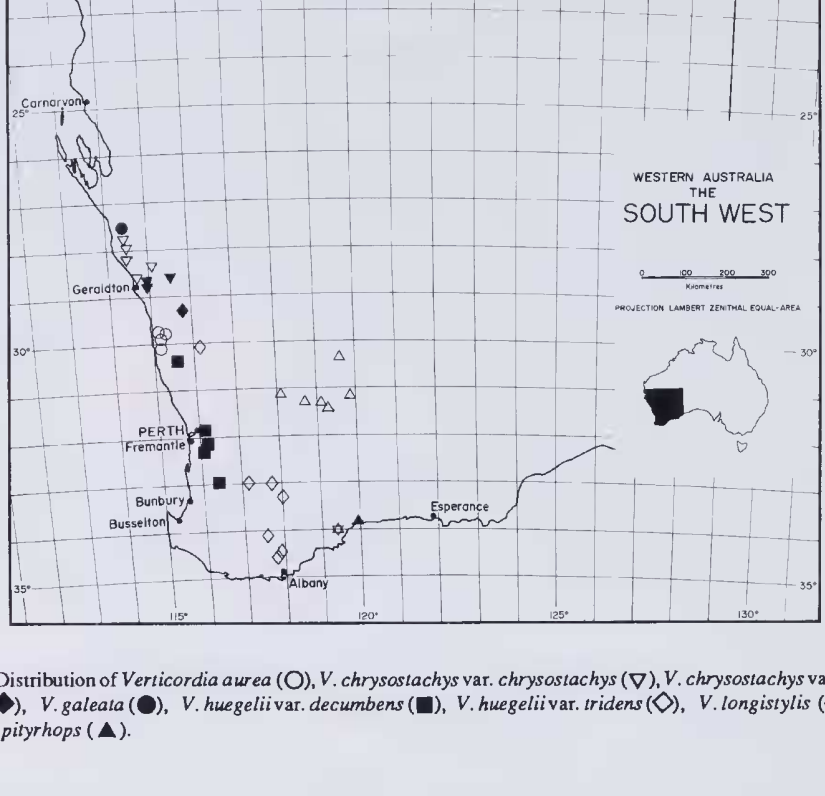

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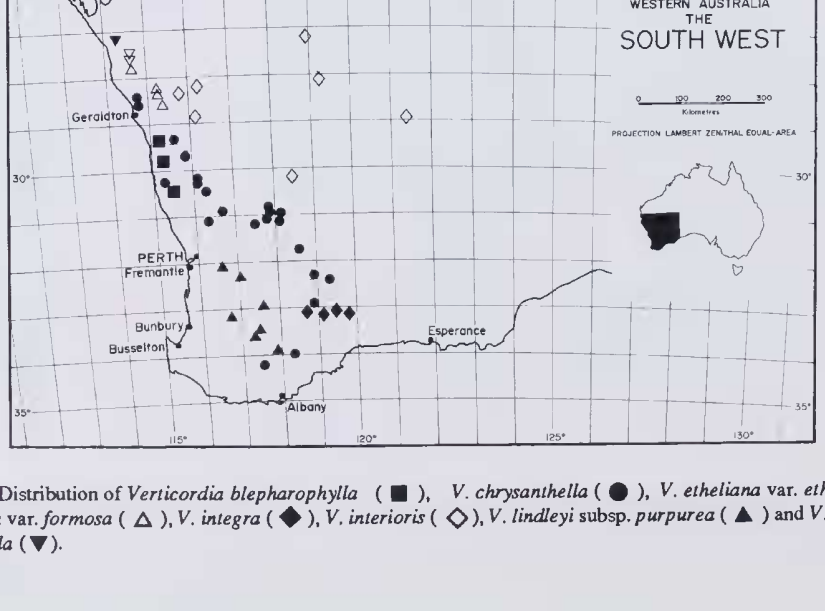

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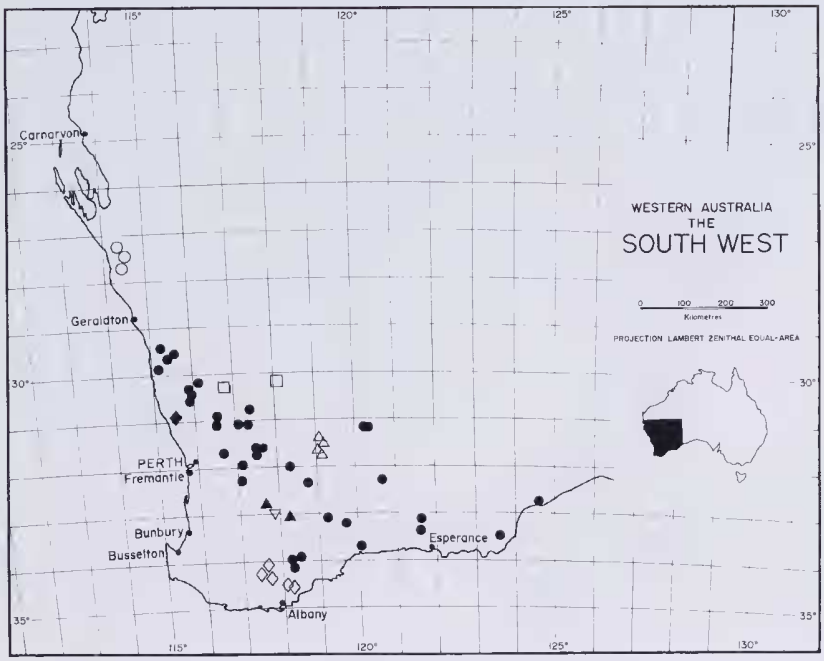

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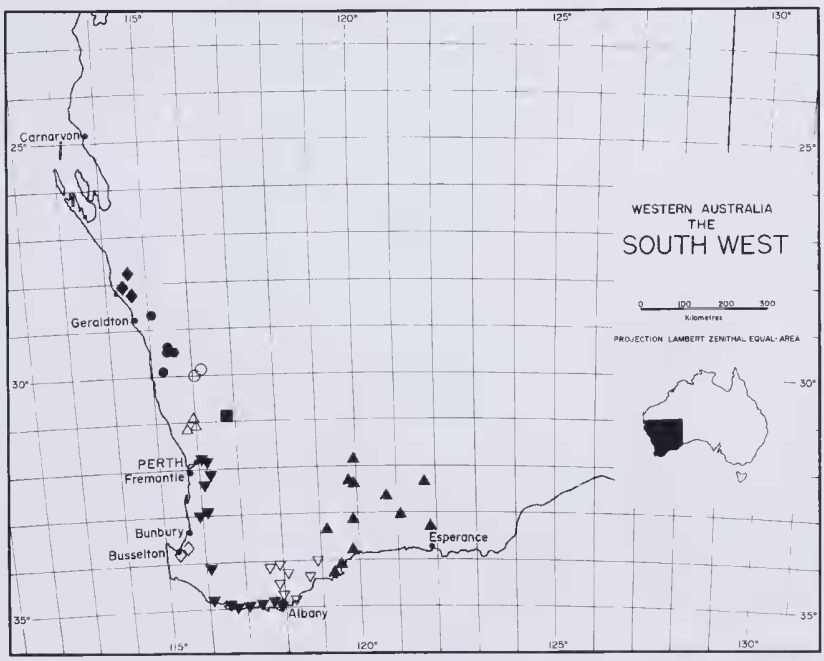

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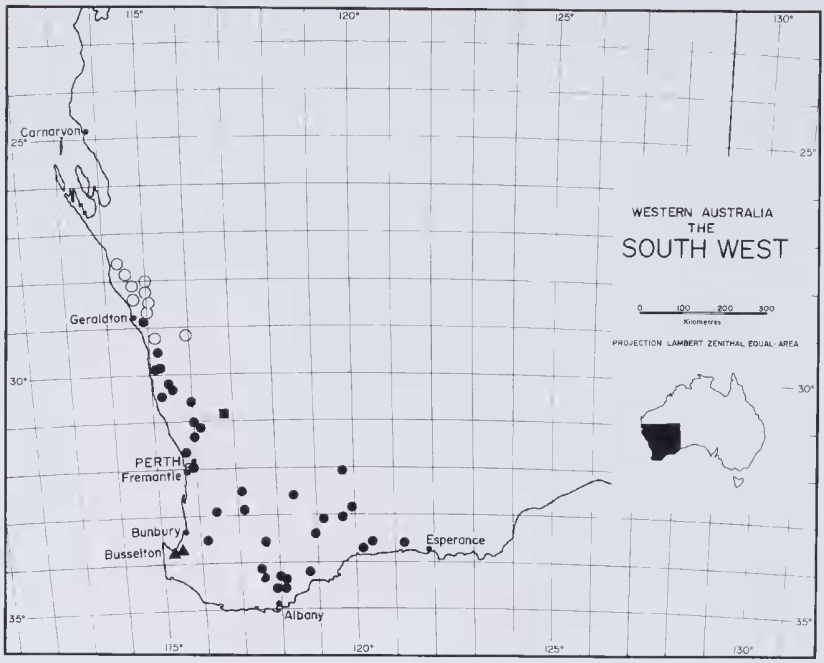

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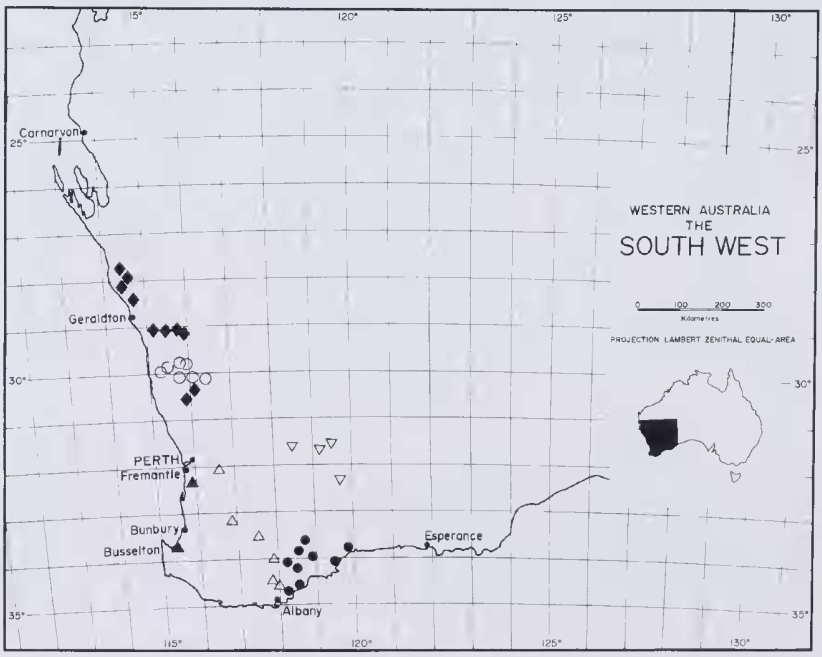

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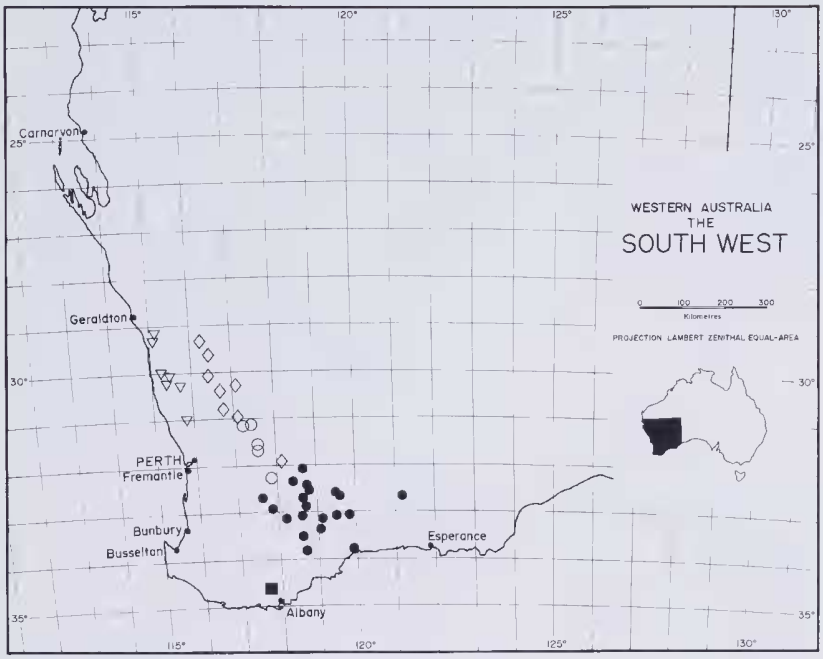

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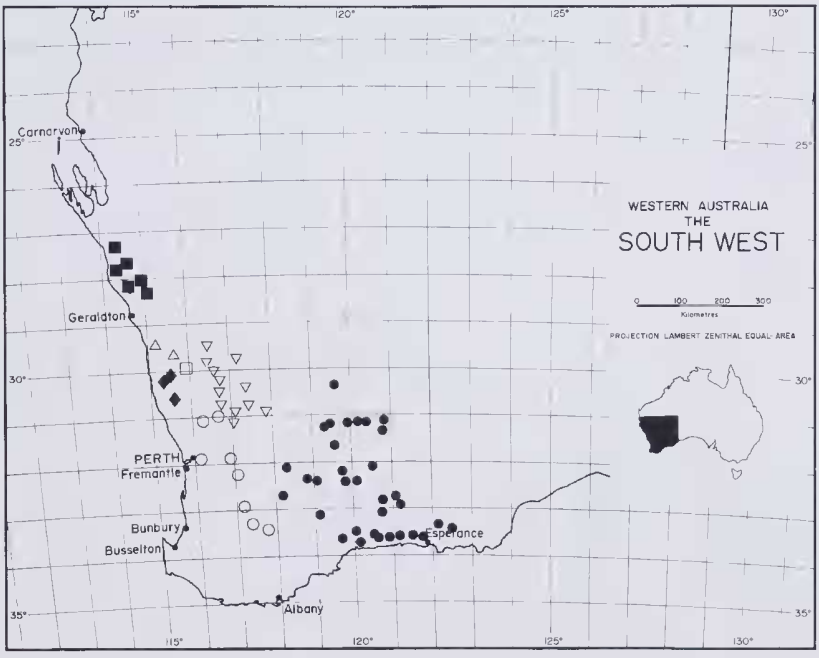

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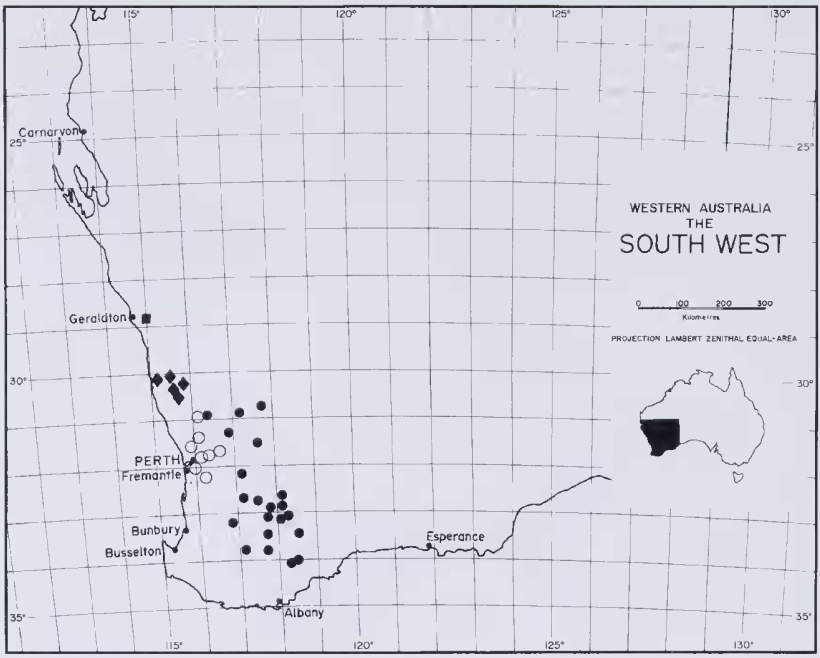

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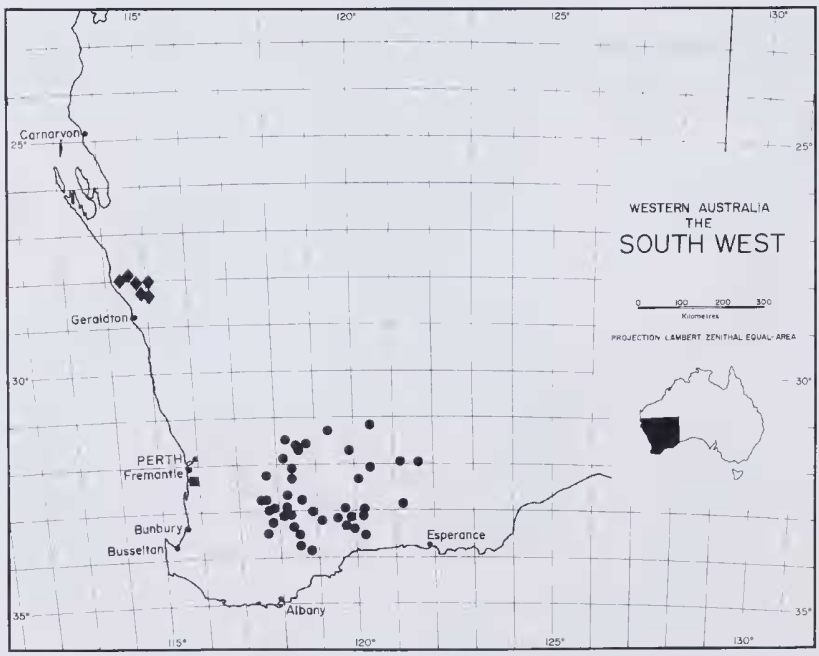

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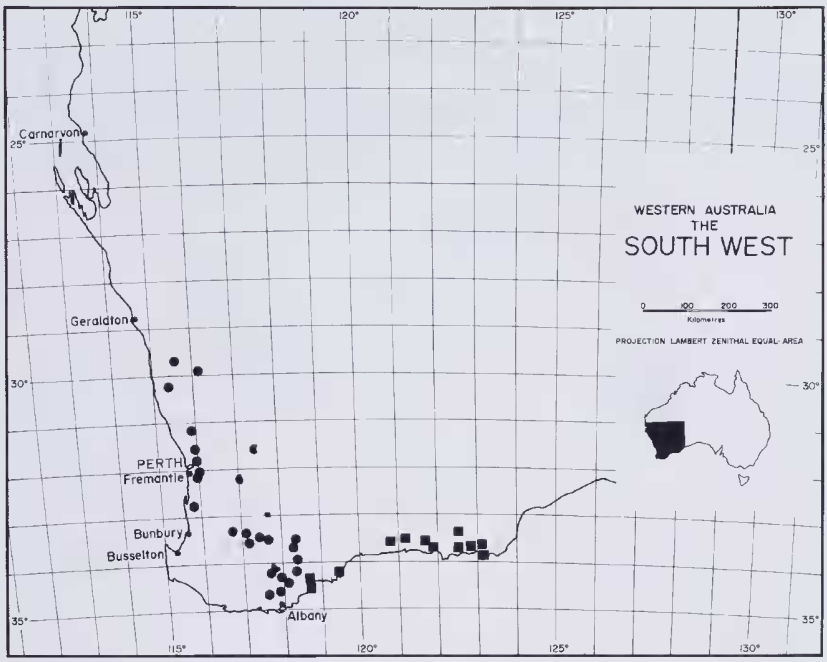

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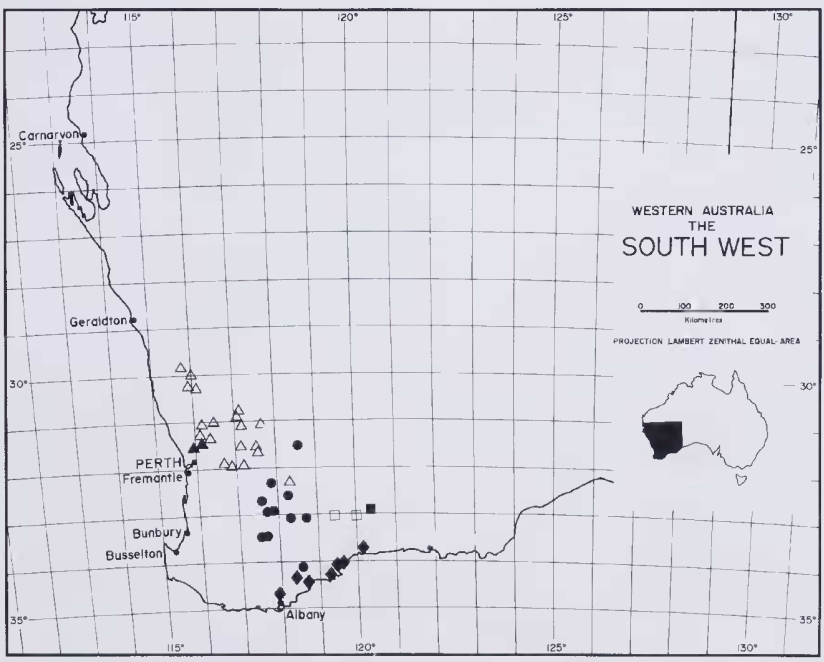

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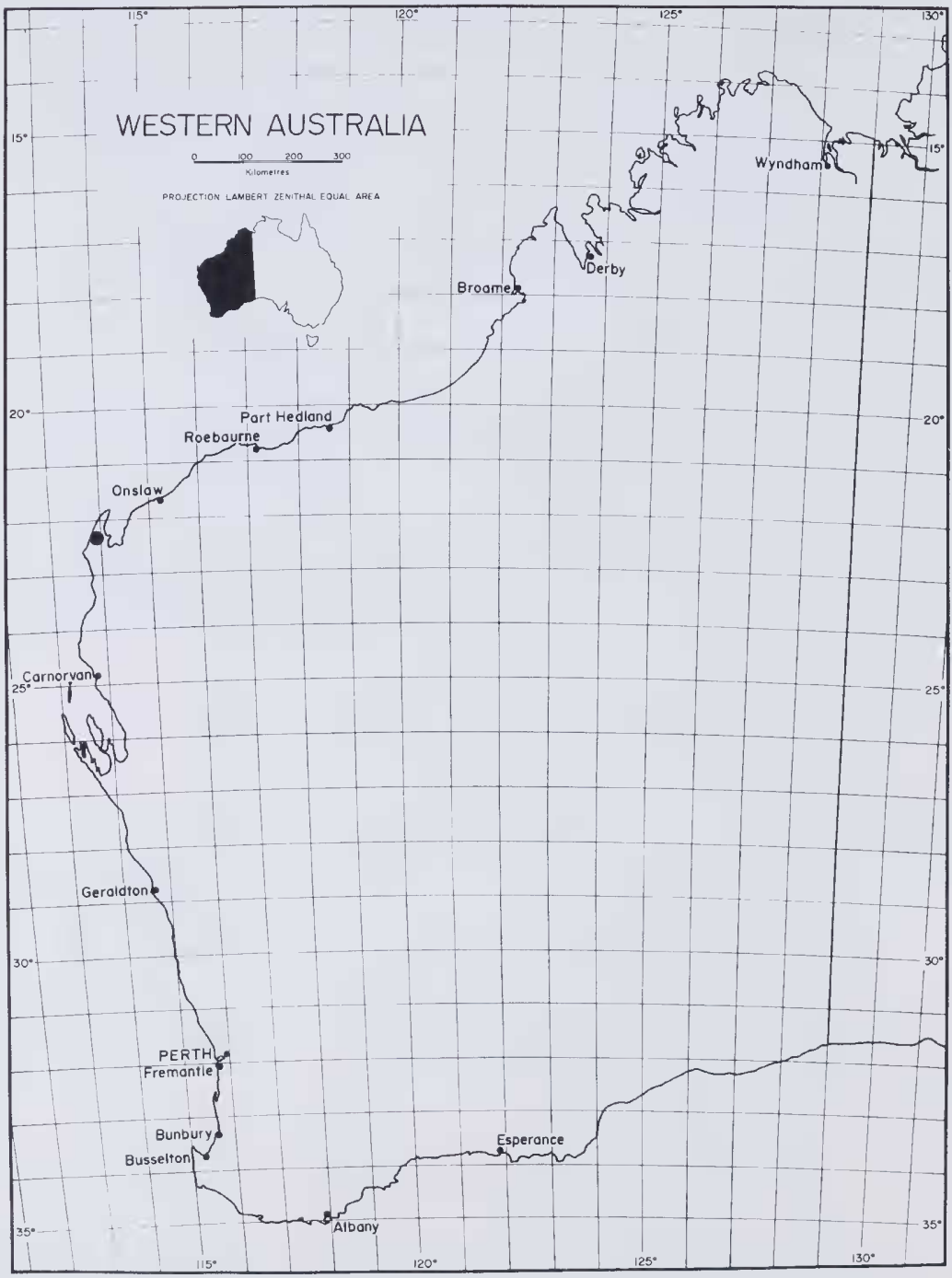

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